The
GEOGRAPHICAL JOURNAL

Vol XCVIII No 3 R.G.S. *September 1941*

EXCURSION INTO THE HAJR PROVINCE OF HADHRAMAUT

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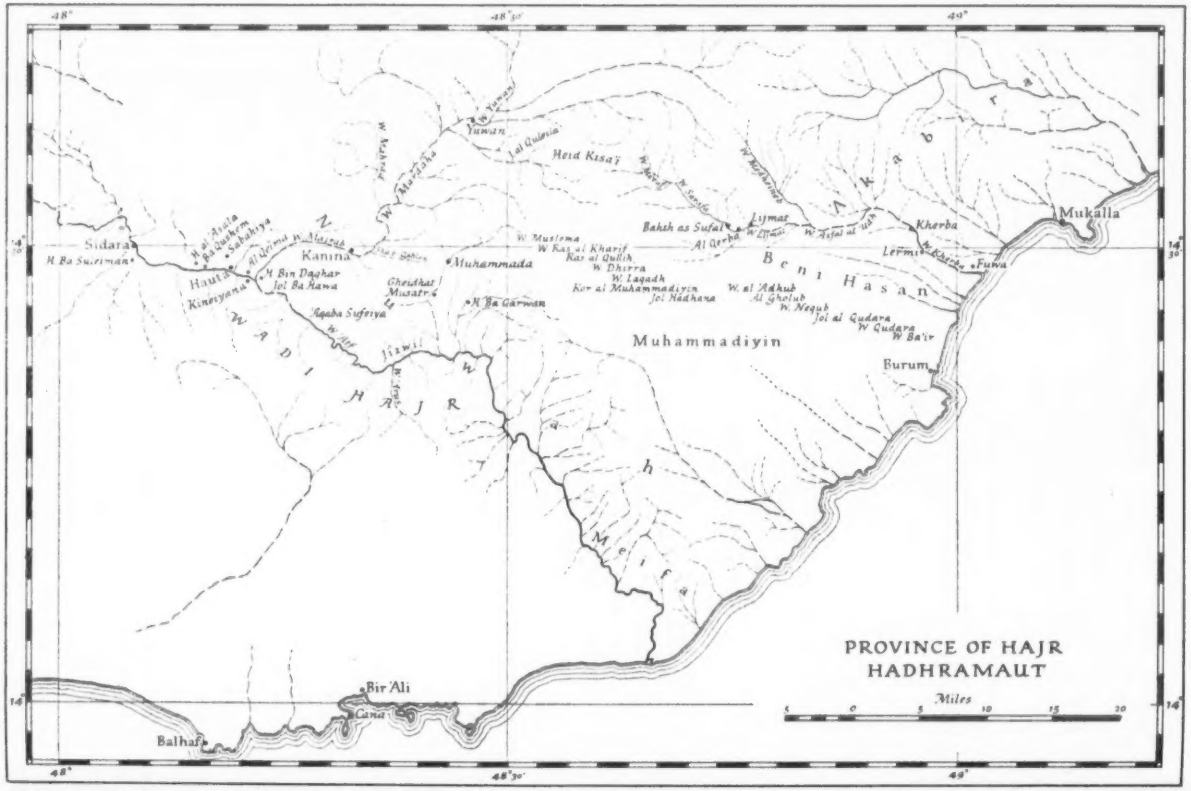
ON Saturday, 25 March 1939, Saleh 'Ali al Khulaqi, an officer of the Mukalla Irregular Army, and I left Mukalla by car to visit the Hajr Province, the only one of the five provinces of Hadhramaut: Mukalla, Shihr, Shibam, Du'an and Hajr, that I had not seen. Two Badawin with two donkeys had left the day before and we were to meet them at Kherba, a few miles to the west of Mukalla. Neither Saleh nor I believe in being encumbered with much luggage, so he stuffed a change of clothes amongst his bedding and sat on the bundle when riding his donkey, while I had three rugs, two pillows, and an overcoat as saddle, taking as well a small bag for clothes, a camp bed, and a despatch box. Our joint items were two saucepans, two kettles, one spoon (for stirring the pot), three plates, two mugs, a lantern, and two water-bottles. Catering was left to Saleh, who bought rations for about ten to fifteen days, to be replenished later at Kanina. We took 10 lb. of rice, 5 lb. each of ghee, onions, flour, and *hanit* (dried fish), 8 lb. of dates, $1\frac{1}{2}$ lb. of ground-up coffee husks and ginger, 1 lb. of spices, 2 lb. of sugar, $\frac{1}{2}$ lb. of tea (for Saleh's benefit), and six tins of tomato pulp, which is a favourite sauce of the Badawin. We added as luxuries three tins of pineapples and some bazaar-made cakes.

We left Mukalla shortly before 7 o'clock in the morning and drove along the beach to Fuwa, where we turned up a wadi and bumped over the stones till we came to the track that goes off westwards to Lermi and Kherba. The road was in a shocking condition after recent rains, but no obstacles daunted the driver, who splashed through the pools in Wadi Kherba, wound among date groves in an astonishing fashion, rebounding from one stone wall to another, and finally climbed a steep hill to the village of Kherba. Outside a large house we found the donkeys waiting for us with their owner, Muhammad of the Samuh tribe and the other Badu, Muhammad of the Al Ba Haj. We rode up the wide Wadi Kherba, part of the habitat of the Beni Hasan and 'Akabira tribes, and after a long spell in the wadi bed climbed slightly to Jol Hadari, then crossed a tributary of the wadi to Jol Sadi, where Muhammad Ba Haj


48°
48° 30'
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Yumun
Jol Qulaita
Haid Kasa'i
W. Mukalla
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went off to a well to fill the water-skins. Wadi Kherba, with the disconcerting habit of most Hadhramaut wadis, now changed its name to Wadi Asfal al 'Udh, which presently bore off to the north to merge with Wadi Medheineb whilst we continued along Wadi Lijmat. For the second time since we started my donkey collapsed under me and Saleh insisted on taking it over while I rode Bukheit, a stalwart black animal. Poor Saleh spent most of the day on his feet, and we decided to hire a third donkey as soon as possible. During the morning we only met two boys and an old woman, and I remarked on the scarcity of caravans which Muhammad Samuh told me was due to the rains, as the Badawin had gone off to the hills to graze their animals. Normally their occupation is taking firewood for sale in Mukalla or carrying goods or passengers from Mukalla to Du'an and Hajr.

We rode slowly through the settlement of Lijmat with date groves, pools of water and grass, and soon afterwards reached Al Qerba, belonging to sections of the 'Akabira. Here Muhammad Ba Haj met his mother tending goats and his sister washing her hair in a filthy pool. The family were not on their own ground but had wandered to Qerba in search of pasture. There were many tall *ariata* trees in the wadi, which brought back to me memories of the Wadi Maseila in 1934 when we had plucked off branches of the ariata to swot the flies that had so pestered us. We halted at 2 o'clock under some date trees near Bahth as Sufal, which belongs to the Ba 'Awadh Muhammadiyin but is also occupied by Al Ba 'Alawi Seiyids. While Muhammad Samuh brewed us some coffee we discussed rifles. He was carrying no arms but the other Muhammad had brought his 1912 German rifle which he said was only an encumbrance now there was peace. It had taken him a year to save up his earnings from carrying goods to Du'an or selling goats to pay the M.T.$500 that it had cost.

We moved on at 4 o'clock following Wadi Bahth, which narrowed considerably, until we left it to climb the long and steep 'Aqabat al 'Arqub from which we had a splendid view over Bahth al 'Ulia. Part of this village is known as Hauta and is enclosed by a wall inside which is the tomb of Sheikh 'Ali Ba 'Umar, a sanctuary. We greeted a passing Badu who returned some time later to offer us a sheep for our dinner. He was so friendly that though we persuaded him not to slaughter his sheep we did induce him to come on farther and spend the night with us. We halted at sunset and Muhammad Samuh cooked us an excellent dish of rice and dried fish and baked some flour bread in the embers.

We spent a very cold night for we had climbed about 2000 feet. I woke early and made tea while the Badawin shivered round the fire, and then started ahead of them up the *'aqaba*. The stillness was absolute and for some time I heard nothing but my plodding footsteps, but gradually the birds began to take an interest in the day and burst into song. Thin veils of clouds hung round the mountains and when I had reached the top of the 'aqaba I sat uncomfortably on a stone on Jol Sarafa and admired the view. When the others joined me we rode, keeping to the left bank of Wadi Sarafa. Wadi Hauradh ran into Wadi Sarafa and the latter winds down to Wadi Bahth but changes its name. At its source it is Wadi Hemerun and becomes Wadi Sarafa about half-way to Wadi Bahth. Rain had fallen on Jol Sarafa and there

Topography from von Wissman's map: The country west of Hadhramaut. In the unmapped Muhammadiyin country the author's names have been struck in order on the approximate route followed.

were bright yellow dandelion-like flowers, a bush with small purple blossoms, another with long petalled red and yellow flowers, and a tiny plant with delicate white flowers. We climbed a very steep 'aqaba leading to a ridge that overlooks Wadis Hauradh and Sarafa. This ridge is so narrow that in times of war the Badawin can make it impassable by blocking it with stones. The top of this 'aqaba is called Ras Sherara and on it were a number of large piles of heaped stones, said to be ancient. We then wound across Jol Mahusah to Naqab Mahusah, an empty rain-water cistern. There had been no rain above Jol Sarafa and it was badly needed. We crossed Wadi Ma'tuf on foot and climbed to Jol Berka, noticing many burnt stumps of the *geradh* tree which is the most popular wood for burning charcoal. The mountain of Heid Berka was to the west of us all day until we reached our night halt, when it came to an abrupt perpendicular end, and on rounding it I found that from the other side it is called Heid Kisa'i.

At 11 o'clock we rested at Qarif al 'Uweifar, a dug out pit for rain water which had a little very dirty looking water at the bottom. Badawin and donkeys drank it, but Saleh and I preferred the spring water from Qerba with which our water-bottles had been filled. Three women bearing loads came and sat down some way off under a *sumr* tree where they were presently joined by an old woman who arrived with her son. The boy joined us and shared our dates and coffee. He and his old mother had walked from Bahth and intended to reach Yuwan the same day. I carried some coffee and dates to his mother and the three women who had come from Yuwan with loads of *dōm*, the berries of the '*elb* tree, which they were taking to Bahth to sell. One of them was a pretty unmarried girl, the second, her mother, had been to Mogadishu with her late husband, a coffee seller, and had three sons living there, and the third was an old toothless friend. They were pleased with the dates as they had had nothing to eat but dōm since leaving Yuwan, and they scraped the coffee cups with their fingers and chewed the grains. Our two Badawin joined us, and though they feigned not to notice the girl at the time there was much discussion afterwards as to whether she was pretty or not. No Badu would think of speaking to a lone woman but, as Muhammad Ba Haj said to Saleh, "If she talks to us and seems anxious for closer acquaintance we're only too willing to comply!"

We rode on soon after 12 o'clock and after an hour's riding Saleh noticed an inscription on a stone as we were passing Qarif Ba Dhalā. We spent nearly an hour looking round and found four large stones bearing much weathered carvings, some of which resembled ancient Egyptian symbols. The best of them we decided to send to Mukalla, subsequently hiring a camel man in Yuwan to fetch it, having made a sign to show him where to find it. The site was scattered with many heaps of stones set in circles with large upright ones in the midst of them. There was a modern cemetery near by, no longer used, but among the Islamic graves were some of perhaps an older date, for they were formed by a wide circle of stones filled in with pebbles and one stone planted upright in the centre of the circle.

We climbed steadily towards the summit of Heid Kisa'i and decided to night at the top of the 'aqaba ('Aqabat an Nemāl) which leads down to Jol Kisa'i. We made our fire in the hollow between the peaks of Jebel Al Quleila

View west from Jebel Kisa'i

Jebel Kisa'i from our night halt

Saleh 'Ali and Badawin loading up

Dwellers in Wadi Yuwan

Saleh ʿAli and Badawin loading up

Dwellers in Wadi Yuwan

on the west and Jebel Kisa'i on the east, a very beautiful setting for the firelight and the Badawin as they cooked the rice and chanted *qasidas* about "Ingrāms."

The voices of the Badawin trying to rouse Saleh, who finds it difficult to get up in the morning, woke me and very soon afterwards Saleh, Muhammad Ba Haj, and I started off on the long, exhausting climb to see the lignite deposits on Jebel Kisa'i. These deposits show a surface depth of 3–4 feet, but the mountain side was so broken up by landslides that it was not possible to follow the seam, though it would appear to cover a stretch of at least 150–200 yards. Saleh and Muhammad dug out specimens of 'coal,' as they called it, and then we wended our way down towards Wadi Kisa'i. By the time we reached the foot of the mountain we had been walking for four and a half hours, so sent Muhammad on to fetch the donkeys, but Saleh and I soon tired of sharing the scant shade of a sumr tree and we plodded on, getting more and more tired and hot, until the donkeys at last appeared and trotted us to a *lethub* tree in Wadi Kisa'i where we refreshed ourselves with ginger coffee, cakes, and a tin of pineapples.

After lunch we rode swiftly over Jol Ras Bisheima until it ended abruptly at 'Aqaba Bisheima where we once again had to take to our feet. We caught a glimpse now and then of houses in Wadi Yuwan, but once down the 'aqaba we rode among low hills which hid the view and we came quite suddenly to the ploughed-up parched fields of Wadi Yuwan. There were many 'elb trees and date palms in the wide wadi and villages rose up on either bank. Although Yuwan is spoken of as though it were a town, there is in fact no such place, but the area round the wadi is called after it and includes eight villages, Al Qarn, Al Qara, Al 'Arum, Al Jinein, Al Kuteifa, Al Quweim, Mahruah, and Al Qari. We rode to Al Qarn where we were met by many of the inhabitants Al Bat-haf and Al Ba Hibri Sultans.

From the moment we entered the mud *dar* of the one-eyed Bin ash Shubeil we had no peace. I was taken straight to the women's quarters and was the object of much smiling and friendly curiosity. A room was prepared for me and water placed in the jar in the bathroom, and as soon as I had washed an interested group of women came to watch me comb my hair and set up the camp bed. They retired veiled to a corner when a number of men came up to talk, but the gathering broke up when dinner was announced. It is customary in Yuwan for guests to eat alone, so Saleh, the Badawin, and I shared a dish of rice and boiled meat.

Before 6 o'clock the next morning, Tuesday, March 28, I heard the mistress of the house call "Duri, Duri, it's morning." Bin Shubeil and his wife brought in a delicious breakfast of millet bread and honey, and it was not long before visitors came in either to hear news of Mukalla or bring complaints. There was a case of a stolen camel, a slave woman who had been turned out of her house, and our host's complaint that the Yafa'i Irregular soldiers were using his house as if it were their own. I was asked to write a letter in English to someone's relatives in India, and another letter to a *halwa* seller in Mukalla. Finally I cleared the room of the men in order to let the women have a chance of talking.

We lunched early and lunch was "on" us, so Saleh ate with the men while

I ate with Bin ash Shubeil's two wives. Afterwards we packed up and walked a mile or so to Al Jinein to stay the night with 'Abdulla Salim Ba Rahim, a silversmith and friend of Saleh's. His house was of five storeys and rather more ornamental inside than that of Bin ash Shubeil, but it was as dirty, so I hastily removed my glasses, which is an effective way of not seeing what I do not want to see. Children abounded in the house, and my room was soon overcrowded with women holding whining babies and grubby little girls clinging to their skirts. A number of the women surprised me by talking Swahili, but East Africa is the country to which this wadi emigrates and many of the men take their wives with them. The man joins up as a soldier, or sells coffee, carries water, or works as a coolie, while the woman bakes bread for sale. After three or four years of hard work they return to live on their savings. The percentage of good looks is high in Yuwan, where the women have shapely, tapering faces, broad foreheads, wide full lips and straight noses, but they sometimes mar their appearance by tattooing, and the young married women consider it attractive to paint the upper half of their faces yellow and the lower half green.

I dined quietly with one of 'Abdulla's wives and went to bed early. In the morning 'Abdulla woke me by bringing tea and cake and his old mother whom he declared was a hundred. We slipped away before the town was really astir. We had parted from Muhammad al Ba Haj, who had been taken on only from Mukalla to Yuwan, and instead we had Yeslem Ba Faqqash, a fine graceful tribesman with a remarkable deep-toned voice. We had also acquired a third donkey. We left Wadi Yuwan shortly after passing Al Jinein, crossed Jol Museijid and Wadi Med-hun and came to 'Aqaba Dhoba, which we climbed on foot. Two Irregular soldiers, one of them extremely old, who were on their way to Sidara, had been walking with us, but at the top of the 'aqaba they took the direct track to Kanina whilst we diverted to see some rock inscriptions in Wadi Mardaha. We had a great deal of climbing to do before we reached the short stretch of *jol* leading to the wadi, and it took three and a half hours from Al Jinein to the inscriptions. They are painted in red on the under-side of an overhanging cliff on the right bank of the wadi. The site afforded excellent shelter: there is water near by and I was told that farther up the wadi there were still many incense trees, so it may well have been a resting place for incense gatherers. I was particularly interested to note that some of the letters were in cartouches similar to ancient Egyptian.

As Yeslem assured us it was only a matter of about three hours from Wadi Mardaha to Kanina we decided to have a hot lunch, and while the rice was cooking Yeslem talked to us of Mogadishu, where he had lived for a short time. He said he often heard from friends who were still there that they are badly treated by the Italians and that there was little profit to be gained. In the old days more money could be earned there than in Mombasa or Zanzibar.

When we left, soon after 2 o'clock, we rode along the *seil* bed until the Wadi Mahrad ran into Wadi Mardaha, when we left the wadi and had a series of long climbs up and down 'aqabas with occasional patches of *wata'* (low places) where we were able to ride. Finally we descended steeply again into Wadi Mardaha and winding some way along the bed we ran at last into Wadi Yuwan, which was now called Wadi Kanina. The wadi was narrow and

full of boulders, and as we were clambering round them and over them we overtook 'Ubeid, the old slave soldier with whom we had parted early in the morning. He was utterly spent and his companion, a younger man, had left him far behind, but he was not alone as he had fallen in with an 'Amudi Sheikh who was on his way from Qeidun, in Du'an, to Wadi Hajr. He introduced himself as the *Mansab* and handed me an ornate silver walking-stick: "The walking stick of Sheikh Sa'id bin 'Isa, the weli," he said. I looked at it with interest, thinking of von Wrede who had so nearly been killed when discovered at the fair in honour of Sheikh Sa'id bin 'Isa. The Mansab then asked my name and when I told him he cried out "Ingrāms! I met him at the Meshhed fair and shook his hand. He's a very good man is Ingrāms." The Mansab had a very small donkey and we had soon left him and the slave behind when we were once more able to ride, though we did more clambering than riding.

Yeslem had completely, though unwittingly, deceived us, for he was thinking of a Badu's capabilities, not ours or the donkeys, and the sun had set long before we were anywhere near Kanina. It was five hours after we had left our lunch halt when we came to the village of Sherij Ba Jamūn on a spur on the right bank. The houses were in darkness but the dogs barked as we passed and it was not long before we had a crowd round us. Yeslem fetched a friend with a lantern who guided us a short way up Sha'b Qahlan to see some more rock writings. The villagers pressed us to stay but we had arranged to be in Kanina that night, so thanked them and went our way, riding along high banks between ploughed-up fields scattered here and there with 'elb trees. It was half-past eight when we came to the steep cliff on which Kanina is built and had another long climb on foot to reach the house of the Naib of Hajr, 'Ubeid Miftah Bensh. He had given up expecting us, but soon produced some tea and made us comfortable in his high, narrow dar. The house seemed strangely quiet for there were no women in it as he had left his family in Mukalla and was there with only a clerk and a servant. After supper he spoke of the caravans from Bir 'Ali and the routes they take to try to avoid paying the customs duties. He told us, too, that since Balhaf caravans which brought a chit from the Balhaf Customs Clerk were allowed through free, goods were much cheaper than they had been, notably sugar which was an anna less a pound. One of the reasons why we had seen no caravans on our way from Mukalla was that the Badawin were mostly going now to Balhaf to bring goods for sale in Hajr and Du'an.

The next morning, Thursday, March 30, the sun woke me and drove me off the roof where I had been sleeping, but not before I had admired the view of Kanina with its tall, tightly packed houses rising one above the other on a steep hill. There were few people about, but the sound of a child's voice singing rose shrilly from the valley accompanied by the creaking ropes of the well from which he was drawing water aided by a cow and a donkey. After breakfast we visited the Al Beiti Seiyids in their new house. Unlike Du'an or the Wadi Hadhramaut the houses in Hajr are mostly built of stone with a mud and straw plaster. They rise to five or six storeys and usually have very narrow windows. Though the men of the Al Beiti family had travelled abroad they had not taken their women with them, so they had never seen anything

like me before. The little girls had been dressed up in their best clothes with their faces painted yellow and green and a broad red band along the centre of their heads. I spent a quiet half-hour with them, and two of the women told me of the killing of their husbands in a feud with other members of the family. Three brothers had been killed in a single fight.

We left Kanina after lunch, waving good-bye from the bottom of the hill to the Naib whom we were to meet again at Muhammada. We passed the village of Sherij ar Rakh, which lies on the left bank, and continued for some way in the seil bed. It was good to see that clouds were gathering for everyone had expressed the hope that rain would fall soon, and better still when we heard distant thunder. As we left Wadi Kanina to climb slightly on to a jol, Yeslem pointed out two caves in the hill-side and said they were bottomless, having been made by falling stars! Of course we felt we had to scramble up the hill to look at them, but found to our disappointment that they were quite shallow and the only sign of a bottomless pit was a very small hole into which we threw pebbles and heard them rattling down for a long way.

Soon after we rejoined our donkeys a slight drizzle began which made us hasten on to Wadi Mazrab, a continuation of Wadi Kanina. We found permanent water there, pools and streams, with grass, date palms, many flowered bushes, and for quite a long way we rode along an avenue of ariata trees. The wadi runs into the Wadi Hajr. We rode close to the village of Mazrab which lies on the right bank and consists of a few dars belonging to Ba Ras Sheikhs and Al Beiti Seiyids. As we drew near the stick huts of Kineiyana, inhabited by Subians, it began to pour, so we sought shelter in a cave already crowded with men, women, children, goats, and donkeys. Muhammad and Yeslem eagerly seized the opportunity to light a fire in order to smoke their *rusheba* (water pipes). The Subian women, who do not veil, sat gazing wide-eyed at us while their babies cried or slept in baskets slung from their shoulders by a leather strap. When the rain turned to a drizzle we set off on foot to try to make our destination—Hauta, before it should pour again.

We followed Wadi Mazrab, keeping to the right bank, until it ran into Wadi Hajr, when we halted to admire the magnificent scene the wadi presented, with its flowing river banked by date palms and cultivation. We turned up the wadi under the cliff on which the village of Duqeim is built, then came to Al Qeima with its houses scattered up the left bank. We were riding among the date groves beyond Al Qeima when we heard shouts and a dull roaring sound. The seil had come. We dismounted to run to the bank overlooking the river-bed but found that the flood was pouring down among the date trees on the other side of the far bank so that we could not see it. We debated whether to cross the river-bed, but decided there was not time if we wished to reach Hauta before sunset. Scarcely had we remounted when we heard another approaching torrent. By the time we had again reached the bank a wall of water was thundering down the wadi and the river-bed became a raging flood stretching over 100 yards to the far bank, on which we might have been stranded if indeed we had not been caught while crossing to it. I would happily climb all the 'aqabas again to see such a sight. Date trees, their trunks bobbing about like some tormented beasts, huge branches of ariata trees, and everything in its path were being whirled along in the tur-

bulent waters. Men and animals are sometimes drowned, and it is a wonder that there are not more such accidents, but the people know when a seil is coming and remove themselves and their movable property out of the route they know it will take. It comes down with immense force, quite impossible to withstand. I roughly estimated a distance of 100 yards and a floating date palm took only fifteen seconds to cover it. The flood was coming from two directions, down the Wadis Hajr and Sirra. As the latter runs into Wadi Hajr just below Hauta we could not night there as we had intended and took shelter under an overhanging cliff.

Yafa'i soldiers from Al Qeima joined us, bringing with them 'Ubeid, the slave, who had managed to stagger thus far from Kanina. Muhammad prepared the supper for all of us. He was perhaps one of the most delightful Badawin I had met, quiet, doing his work without fuss or shouting and with no vestige of that "I wonder what bakshish I'll get" look with which some Badawin are spoiled. He and Yeslem kept away the small boys who wanted to climb up to see us, but we welcomed a number of Subians who came up when it was quite late in order to pour out some complaints. When each had had his say it was so late that instead of returning to their homes they curled up for the night on the rocks beside us.

We could not be off early in the morning as we had to wait for the seil to calm down and it was 8 o'clock when we crossed Wadi Sirra. The torrent was fordable but it had reached about 20 feet, for we could see the high-water marks on the banks. We climbed to the jol between Sabahiya, on the right bank of Wadi Sirra, and Hauta, a large village on the left bank of Wadi Hajr, and rode swiftly over the plain of Jefjef. Over on the right bank of Wadi Hajr we could see the village of Ba Qusheim, occupied by Ba Hasan Subians. Wadi Hajr is extensively inhabited by Subians who are all cultivators. They are descendants of the Abyssinians and they are much darker skinned than the Badawin. Owing to the peace they were happier now than they had ever been, for they could grow their crops and cultivate their date palms without the perpetual fear of robbery by tribesmen, particularly by the Deiyeb tribe from the west. I saw many traces of this oppression among the date groves where many palm trees had been ruined by having kerosene poured over them.

The Yafa'i soldiers in Husn al 'Asala, built by Sultan Ghalib on a spur with a good command of the wadi, called to us to visit them as we passed, but we were anxious to reach Sidara, so we trotted on until we came to a large area of cultivated land where it was difficult to urge on the donkeys who found much to satisfy their hunger in the millet fields. Much of the land belongs to Government who bought it from the Bal Baheith, who own a great part of the wadi in the neighbourhood of Sidara. There are a number of hot springs on both banks, and though advantage has been taken of this water there is room for more extensive cultivation. Bullrush millet is the staple crop, and as we rode through the fields the women and children, perched on wooden supports to throw stones at the birds, were diverted from their work by the unusual sight we presented. When we had ridden beyond the cultivated area we came to a wide plain thickly covered with *'asaf* palm from which the people obtain their *nebidh* by cutting down the

palm and letting the sap flow into straw cups. The palm grows again and it is said that one palm can be cut down about eight times before it ceases to yield the wine. The very poor consider nebidh as both food and drink, and indeed it must have a satisfying effect, for I have never seen more sturdy or fatter Badawin than those who live near here. But it is intoxicating, though the people declare that only nebidh drawn off when the sun is high is *haram*, and that it is lawful to drink it in the early morning.

When we reached the bank opposite Sidara we found that another seil had come down, so we had to wait for two hours until we could ford the river. The first to cross was a Yafa'i soldier from the opposite bank who had to swim and was swept at least 100 yards down stream. He was followed by several others who arrived dripping and out of breath. Some of them led the donkeys across while others carried our bedding, holding it high above their heads. The water was up to our shoulders and Saleh and I half waded half swam across, but 'Ubeid, who was almost dead with exhaustion, was carried by two of the soldiers with much laughter. The Qaim (District Governor) of Sidara had gone to Mukalla and the Muqaddam of the Irregular soldiers was inspecting Government lands, but a runner had gone to tell him of our arrival, and meanwhile we were taken to his dar where we were able to change our wet clothes. I was given a room on the roof with a ceiling of palm fronds laid over wooden poles. The houses in Sidara are of stone and built high and narrow with slits for windows. They expressed clearly the state of insecurity that had previously existed there.

In the morning, after a good night's rest, I was awakened by Yeslem who brought me a cup of tea followed by the Muqaddam with some nebidh in a large plaited straw cup, which I found extremely good. The Muqaddam insisted that we should lunch before leaving, so a large dish of rice and meat was set before us at half-past nine. We started off at ten, after I had spent a few moments with the family of the Qaim. We kept to the right bank of the river-bed until beyond Husn Ba Suleiman, when we waded waist deep to the left bank, where we rejoined our track of the day before. About a mile from Husn al 'Asala a pile of stones marked the spot where fifteen days before a Ba Rasheid tribesman had been shot by an Al Zagheib. He had been wounded in the shoulder and we could see his bloodstains on the path along which he had staggered to Al 'Asala. The Al Zagheib had fled, but his relations were as anxious as any one else to give him up to justice, for he had broken the truce.

While we halted for coffee near Al Qeima an old man brought us some small fish he had caught in the seil, which afforded a welcome change of diet. We rested for an hour then rode on, passing under the perpendicular cliff that juts out into the wadi north of Al Qeima. There had once been a fort on it, known like others in a similar situation as *Masna'a*. These Masna'a are frequent from Sidara down the wadi and the forts have a good command over a wide area. We wound among date palms, crossed the mouth of Wadi Mazrab down which we had ridden the day before, and rode on along the left bank of Wadi Hajr to Hussein bin Daghar. The Bin Daghar were once a large tribe after whom the wadi took the name Wadi Hajr Bin Daghar, but now the tribe numbers only some thirty men. We were now in that part of the wadi

where dates are the principal produce. During the *kharif* (the date harvest season) the banks are lined with the camps of those who come from Yemen, Aden, and all parts of the country bringing goods to barter for dates. On the outskirts of every village there are open spaces covered with pebbles from the river-bed on which the dates are exposed. Tunnel-shaped shelters of stone are built near them and there the people who own the dates go and live for the season.

We stayed the night with a Yafa'i soldier at Jol Ba Hawa, where Government owns an extensive area of date groves. The next morning, Sunday, April 2, we left before 6 o'clock as we had arranged to visit some ruins which a Badu had declared existed at Wadi Bana, some five hours away. Soon after leaving Jol Ba Hawa the wadi narrowed and we had to leave it to climb 'Aqaba Sufeiya, winding down again to that part of the wadi known as 'Atf. We met a small caravan on the 'aqaba bringing dried fish from Meifa, and a wild-eyed camel that had lost its senses and was careering round the hill-side chased by a distracted Badu. We had to ford the river over and over again, and after four hours' walking and riding we turned west towards Wadi Nu'ba, which runs into Wadi Hajr. We halted for lunch near the few huts of Nakhala, which our guide had told us was only three hours from Jol Ba Hawa. We had intended to leave Muhammad here with all the luggage while we rode on swiftly to see the ruins and return to night at Nakhala, but we had taken so much longer to reach our lunch halt than had been expected that I suggested we should all go on together, for if there proved to be anything worth seeing I should prefer to stay the night at the ruins. So after a quick lunch of bread and dates we started up the very rough and winding Wadi Kharash Haqq an Nu'ab where we soon found boulder after boulder covered with inscriptions. There were several with letters in cartouches, but the best inscription was on a large boulder somewhat similar to the one in Wadi Ser (described by the Bents and which we had seen in 1934) which was thought to be a caravan signpost.

From Wadi Kharash we climbed an 'aqaba to Jol ar Rubeiya, thence down into Wadi Rubeiya, and all the way along we found inscriptions carved on the rocks. We continued for several hours climbing up and down 'aqabas while our guide irritatingly repeated "It's just here." In fact instead of five hours from Jol Ba Hawa to Bana we took ten. However when at last we reached a hill-side overlooking Wadi Bana and saw a massive stone wall barring the way, we felt it had been worth it.

It was after sunset, so I could do no more that evening than take a general look round and copy down part of the long well-cut inscription on a stone in the passage formed by an opening in the wall. I did not know at the time that von Wrede had been there and that this inscription had been published or I might have saved myself the trouble! That night I set up my bed in the passage-way in the vain hope of dreaming of the ancient caravans that must have passed this way.

Early the next morning I copied the rest of the inscription and examined the wall more closely. It covers about 200 yards from the steep hill on the west to the edge of the perpendicular cliff leading down to Wadi Bana on the east. The wall is now about 16 feet high, but the top has been so broken up by Badawin hoping to find treasure that it is not possible to judge its original

height. It is 6 feet thick but widens to 17 feet on each side of the opening, where, perhaps, there had been a guard-room on top of the wall. The wall was built of long well-shaped stones filled round with cement. Saleh and I went down to the wadi bed which was banked by steep cliffs, but wherever there was a possible route up from the wadi leading in another direction than the wall, it had been blocked by high stone walls. Thus the only route for caravans was through the passage-way in the wall. The wadi near here has permanent pools of water and we met a number of unarmed Badawin carrying water-skins. They were Ba Ras Sheikhs and Ba Rajjash tribesmen bringing rice and sugar from Balhaf for sale in Du'an. When they had filled their skins we all returned to the wall where we sat talking until their long line of camels came over the brow of the hill led by a small boy. This road is the direct route from Bir 'Ali and Balhaf to Hajr, thence to Du'an, though some caravans go by way of Wadi 'Arus and Neqeb. To-day the wall is considered the boundary between the Nuwah and Ba Qutmi, but the Badawin knew little or nothing about its history. Some of them said it was built by "Kaffirs" for defence, but one of them whose father, he said, was something of an historian, had been told by him that it was a king of Sabota (he used this word) who had built it. It seems likely that it was a customs post and perhaps the boundary between two states. I was told that incense trees are still plentiful in the hills near by and no doubt this was one of the principal incense roads from Cana to Sabota.

Our return journey to the Wadi Hajr was made somewhat easier by the fact that we descended most of the way. We did not go back to Nakhala but branched off before reaching that settlement and passing Husn Nu'ab we crossed a long stretch of jol and then once more came to Wadi Hajr. There we chose a shady spot for lunch and I had a refreshing bathe in the river. We had, too, a pleasant change for lunch, sweet potatoes, which were so plentiful that about 150 lb. could be bought for a dollar (about 1*s* 6*d*). An old woman helped us to gather firewood and was given some lunch and my irrevocably torn dress for her trouble. She said she only possessed the one filthy-looking garment she was wearing. Though she would not be seen about in mine during the daytime, as it was not fashionable, she said she would wear it in the house so that she could wash her own.

When we set off at 3 o'clock we waded to the left bank where we rode among cultivation which stretched all the way to the settlement of Jizwil. We dismounted to look at some large mounds of stones and earth, resembling those near Hajarein, Meshhed, and Hureidha. On the top of them there were stones piled about 3 feet high and arranged in a rectangle, the centre being filled with pebbles. They looked like graves, and in fact the place is called Qubar al Kufar (The infidels' graves).

We now turned north-east, leaving Wadi Hajr and the still distant village of Jizwil to the south-east, and trotted fast over a jol. We only caught a glimpse of the houses of Husn Ba Qarwan as we made haste to reach Muhammada before nightfall. But it was a long ride and the sun had set when we came to Wadi Muhammada and passed below the village of Gheidhat Ba Musatr. The wadi narrowed considerably, but we had the light of a nearly full moon to guide us, which threw up sharp corners of the hill-sides into

On the way from Yuwan to Kanina

Muhammada

The wall at Bana

Sidara

most fantastic shapes. Muhammada is a small town of large houses, second only in importance to Kanina, the capital and main market town of Hajr Province. The Naib spends his time between the two towns and we renewed acquaintance with him here, but as the government *husn* was rather small the Qadhi kindly put us up for the night.

The next morning, after breakfasting with Seiyid Ahmed al Beiti, the Qadhi, we received many visitors, among them an older brother of the Badu we had met at Bana who had told us the wall was built by a king of Sabota. The brother added that it was constructed as a customs post. He said, too, that there was a broken-down wall in Wadi 'Arus, another route from the coast, and that its foundations were similar to Bana but that it had been rebuilt to serve as a barricade when the Qu'aitis were fighting the Wahidis. He told me also that the inscriptions painted in red, like those at Mardaha, were known as Himyar al Masnad.

During the morning we took a short walk down the wadi to see bituminous deposits. It was extremely hot as Muhammada is enclosed by hills and there was thunder in the air. We meant to leave at 3 o'clock in the afternoon, but were delayed by a heavy fall of rain. The people were pleased for there had been no seil that year, but the rain did not last long, and having been assured that the wadi would not be flooded we set off in the late afternoon. We had a long climb to the head of the wadi and then descended into Wadi Muslema where we had a long ride by moonlight before settling down for the night in the seil bed.

For many miles the next day the wadi curved and twisted in all directions and the cliffs obscured all view of the surrounding country. Two hours after we had started we halted near a water-pool for the donkeys to have a drink, and while Muhammad took them away Saleh, Yeslem, and I prepared lunch. Yeslem cut up onions, Saleh poured ghee into the saucepan, adding a pinch of mixed spices, a tin of tomato juice, and the onions, while I pounded up the dried fish with stones. This went into the pot too and the mixture was allowed to cook for a short while before the rice was thrown in and water added. The result, as usual, was excellent.

In the afternoon we rode along Wadi Ras al Kharif, seeing nothing but cliffs until the flat summit of Ras al Qullih rose above the wadi walls. We reached the narrow watershed between Wadis Ras al Kharif and Dhirra, where we had a splendid view of the peaks towards Burum but no sight of the sea. We then had a long descent into Wadi Dhirra, which presently changed its name to Wadi Laqadh. Again our view was obscured by the wadi banks, but every now and then we could see the massive Kor al Muhammadiyin towering above the hills around it. We were in the terrain of the Muhammadiyin tribe and met a number of them who stopped to pass the time of day and hear the news. When we left Wadi Laqadh we bore south-east across Jol Hadhana where we saw a number of inscriptions on stones and boulders. We crossed a track that leads to Burum and continued almost due east until after sunset, when feeling hungry and the moon not yet risen we halted for dinner. We rode on afterwards by moonlight, climbed 'Aqabat al 'Adhub and descended into Wadi al 'Adhub along which we rode till eleven o'clock, when we decided we needed some sleep.

I was the first to wake on our last morning (Thursday, April 6) and roused the others with some difficulty. Not far along the wadi we came upon an encampment of Ba Dubian Badawin. The families were each in their own caves or shelters sitting round the fires preparing breakfast. Some were baking bread in the embers and others were cooking it in goats' milk. They invited us to eat with them but we were pressed for time. They had come there from their own territory as there had recently been rain and the hills were so green that in the distance they looked like the wooded hills of England. We halted in a part of the wadi called Al Gholub, where there is water. Some Badawin joined us with an 'Amudi Sheikh, a poor old man who travelled round among the nomads giving advice and receiving food in exchange. The Badawin, like others before them, asked if the "Fear" would begin again when the truce came to an end. I asked them if they wanted to renew their old feuds and there was a chorus of "No." The difference caused by the peace was apparent everywhere and not more so than in the fact that we had been able to engage Muhammad Samuh for the whole trip. Before the peace we would have had to change our donkeys and Badawin several times and paid someone to be our escort through each tribal area. Neither Muhammad nor Yeslem could have travelled freely through the Province, but now they frequently met and talked to those with whom in the old days they would have exchanged shots.

When we left the wadi, which was now called Wadi Nequb and which runs to the sea between Burum and Heru, we bore east and climbed to Jol al Qudara where we found more inscriptions. The jol led down to Wadi Qudara which we crossed and then came to Wadi Ba'ir where we turned south towards the sea. We halted at midday in the scant shade of a boulder and settled up accounts before coffee. On the first day I had handed over the bag of dollars to Muhammad who had hidden it amongst the rice. From that moment I had not had to bother with it again. Saleh had taken whatever money was necessary and now Yeslem produced a written statement of the expenses and Muhammad produced the dollars. I settled up everything there and then and found that the inclusive cost of the whole trip was under five pounds.

We left our boulder at 3 o'clock in the afternoon and had a somewhat tedious ride over jols towards Fuwa. There we were met by my husband and Sultan 'Awadh with a car. We took Saleh and Yeslem to Mukalla in the car, but Muhammad stayed the night in Fuwa and brought in the donkeys the next day. He took two hours along the beach. We took twenty minutes.

A SUB-ARCTIC GLACIER CAP: THE WEST ICE OF NORTH EAST LAND

A. R. GLEN

Continuation of a paper from the August Journal

Accumulation and ablation

THIS section is based on observations at (1) the base, and (2) the central West Ice station. These observations are then used to illustrate conditions in (*a*) the accumulation area, and (*b*) the ablation area. The greatest care must therefore be taken in keeping each of the above distinct.

Between September and June accumulation above the firn line is caused almost entirely by snowfall, by the positive effects of drifting, and by indirect supply from water vapour and super-cooled water droplets. During this period the effects of rain or hail are negligible.

The solid precipitation in the accumulation area of the West Ice between August 1935 and August 1936 can be estimated at between 170·0 mm. and 210·0 mm. of water. The smaller figure is the measured precipitation at the base, taken for this purpose to the nearest 10 mm. The larger figure is reached by calculating the ratio between the snowfall measured during eight and a half months, the total period of observations, at the central West Ice station (153·5 mm.), and that measured during the same time at the base at Brandy Bay (103·0 mm.). The resultant ratio is 1·5 : 1 which must be applied to the figure for twelve months' precipitation at the base (167·5 mm.), thus giving an upper limit of 250·0 mm. for the central West Ice station. This upper limit must now be corrected for the effect of drift snow, large at the central West Ice station and negligible at the base. An exact value for this correction cannot be given, but it should be safe to say that drift snow contributed not less than one-sixth of the measured precipitation at the central West Ice station. The ratio of precipitation at the central West Ice station to that at the base is therefore taken as 1·25 : 1, giving a final upper limit of 210·0 mm. of water for the year's accumulation at the former.

There is no known relation between precipitation and altitude, but this ratio of 1·25 : 1 does not seem unreasonable. The central West Ice station was at a height of 530 metres in the centre of a small glacier cap only some 25 miles from the base, and not in its rain shadow. This certainly makes it most improbable that the snowfall at the central West Ice station was less than at the base. The limits of between 170·0 and 210·0 mm. of water would thus appear sound, but the true value is probably nearer the lower than the upper limit for one-sixth is likely to be an understatement of the amount of the measured precipitation contributed by drift snow.

In 1936 at the central West Ice station the maximum point of the year's accumulation was reached in early June, after which ablation exceeded accumulation. At that time an average measured density of 0·34 gm./c.c. gave the 110·0 cms. of accumulation an equivalent water value of about 370·0 mm. The positive effects of precipitation had continued at least since September of the previous year, but the observations at the station had been

begun only in October. The precipitation measured at the base since September was 103·5 mm. of water, which from the ratio of 1·25 : 1, would give an upper limit of about 130·0 mm. for the precipitation at the central West Ice station between 1 September 1935 and 6 June 1936. Of the year's maximum accumulation of 370·0 mm. of water, only 130·0 mm. at the most could thus have been contributed by direct precipitation, leaving an excess of at least 240·0 mm. which could have been supplied in two ways. These are drift snow, and deposits of hoar frost, rime, and glazed frost.

Observations taken at any one point may be much complicated by drift snow. Part of the snow that is removed by wind is redeposited at lower levels. If snow from the accumulation area is removed outside that area there is involved a gross loss to the accumulation area and a net loss to the whole glacier cap. The difference between these is the amount carried outside the glacier cap plus that amount of the remainder consumed by the greater summer ablation at the mean level of redeposition than at the mean level of origin. Drift snow that is removed from one part of the accumulation area and redeposited in another part has of course no effect upon the economy of the area.

In accumulation glazed frost is particularly important both because of its direct effects and the part it plays in the production of ice crusts. Hoar frost and rime never caused any noticeable increase in the surface level, but their indirect influence in the "settling" of the surface layers was probably considerable. The increase in density for example of a 3-cms. snow layer from 0·1 gm./c.c. to 0·3 gm./c.c. gives the same equivalent water increase as 12 cms. of newly fallen snow. With hoar frost careful distinction must be drawn between true hoar frost the water vapour supply of which is drawn from the atmosphere, and hoar formed on a snow surface as a result of the condensation and freezing of water vapour from the ice itself passing from a zone of greater to a zone of lesser vapour pressure. The former represents an increase in the accumulation, but the latter is merely an interchange of supply within the body of the ice.

At the same time as the year's maximum total accumulation was measured at the central West Ice station, profiles were being examined in the accumulation areas of the West and South Ice. If the figures for the year's accumulation in these profiles are averaged, the positive influence of drift snow should be eliminated, it being assumed that the loss to the accumulation areas through drifting is greater than the positive effect of snow derived from outside that area. It should be added that the south wind had the greatest effect in this connection, and that the only possible source of additional supply to the West Ice was therefore the South Ice. It is for this reason that the profiles of the South Ice were averaged against those of the West Ice, as described above. The profiles give an average figure of about 90 cms. of snow, or, on the basis of a density of 0·34 gm./c.c., a water equivalent of about 305 mm. The accumulation by snowfall must be $<$130 mm., and that by rime, hoar frost, and glazed frost must be 175·0 mm.[1]

[1] At the time of publication of Mr. Moss's paper "The physics of an ice cap," the material mentioned had not been examined in detail. Its full examination has caused the change in view expressed.

Strictly the effects of autumn, winter, and spring ablation should have been considered, but it is impossible to do so satisfactorily. All that can be said therefore is that of the year's maximum accumulation >58 per cent. was supplied by rime, hoar frost, and glazed frost, and <42 per cent. by snowfall. This implies that at the central West Ice station, where the maximum accumulation was 370·0 instead of 305·0 mm. of water, either winter ablation was less or drift snow supplied an excess of some 65·0 mm. of water.

In 1936 it was found that in the accumulation area an average balance of 75·0 mm. of water was left after the total summer ablation.[1] The year's maximum total accumulation in 1936 has already been found to average 305·0 mm. of water. Accordingly the summer ablation in the accumulation area must have been sufficient to have removed the 305·0 mm. of water plus the summer accumulation minus the balance above mentioned, *i.e.* 75·0 mm. of water.

Between June and the latter part of August, the measured accumulation at the base was about 60·0 mm. of water, which would suggest an upper limit for the central West Ice station of 75·0 mm. of water. The effects of indirect accumulation seemed to be considerably less during the summer months than during the rest of the year, and, if they contributed as much as the direct precipitation, a total of about 150·0 mm. would be suggested. If this figure should seem unduly large in comparison with the year's maximum total of 305·0 mm., it must be remembered that the latter has been reduced by the autumn, winter, and spring ablation, and that the precipitation in June and July was the greatest for any two months.

An average value for the balance left after the summer ablation has been taken as 75·0 mm. of water. Accordingly, on the basis of a year's maximum total accumulation of 305·0 mm. plus an accumulation of 150·0 mm. between June and late August, a summer ablation of around 380·0 mm. of water is implied. The true figure must be less than this however as the average surplus of 75·0 mm. of water takes no account of the loss by the snow cover of the melt-water which has percolated into the previous year's firn. This amount of water, melted either through the effects of radiation or convection, does not represent a loss to the accumulation area, as it will be refrozen in the firn-ice band zone by the winter cold wave. The total loss by summer ablation is therefore given by the figure <380·0 mm., and the difference between this and the actual loss is the amount in mm. of water which has percolated into the underlying firn. It is not possible to give any estimate for this, and attention can only therefore be drawn to it as a source of error.[2]

Although no detailed measurements of the summer ablation could be made by the 1935–36 expedition, from general observations made and from the previous investigations of Ahlmann a description of the main features of the summer ablation period can be given. The most important factors affecting the summer ablation are the radiation income and convection through the air.

Angstrom has suggested that the radiation income of the polar regions is

[1] On the Isachsen Plateau in 1934 Ahlmann measured an annual balance of 200·0 mm. of water, indicating the more active glaciation of West Spitsbergen.

[2] On the Isachsen Plateau in 1934 Sverdrup calculated that, when the annual balance is 400·0 mm. of water, 145·0 mm. of this percolates into the firn and freezes at that depth at which the temperature is negative.

considerably higher than had been previously believed. The earlier estimates were based on the albedo which had been found for the cloud layers at lower latitudes, namely 72 per cent. Recent researches have shown that the albedo of the uniform cloud layer is probably variable with latitude, and that around the 80th parallel it is possibly not greater than 50 per cent. The high transmission of the cloud layers therefore explains the high radiation income found in the summer months in North East Land, despite the prevalent cloudiness and the high angle of incidence of the solar rays. The results of the Swedish–Norwegian Expedition in 1931 showed that the radiation income in Murchison Bay during July was about 13,000 gms./cals., or just about the same as that in Stockholm during the same month. The average cloudiness in Murchison Bay during the months in question was 8·6.

Angstrom gives a formula for ablation under positive air temperature conditions:

$$h=(0{\cdot}027 \cdot Q+0{\cdot}05\, v \cdot t)\Delta T$$

where h is the ablation in mms. of water, Q radiation income in gm./cals. per sq. cm. an hour, v wind velocity in metres per second, t the air temperature, and ΔT the time in hours.[1]

With present information the calculated figure for summer ablation of <380 mm. for the accumulation area of the West Ice cannot be compared directly with Angstrom's formula, but the ablation at the firn line at around 450 metres can be estimated. There the ablation period may be taken as from the middle of June until the middle of August. By June the surface snow temperatures at the central West Ice station were steady around 0·0° C., so that all the energy conveyed to the surface could be used for melting and none for raising the temperature. The mean air temperature at the firn line during the summer months of 1936 can be estimated at just above freezing-point or perhaps at about 0·25° C., while the average wind velocity must have been around 5 or 6 metres per second. Cloudiness as observed at the base in June, July, and August was respectively 8·3, 6·7, and 8·1, so the hourly radiation income in June is probably not higher than 10 gm./cal./sq. cms., while that in July may be estimated at 15, and that in August again at 10 gm./cal./sq. cms. This would suggest from the formula an ablation of around 500·0 mm. of water.

The maximum point for the year's accumulation was estimated in early June at about 305·0 mm. of water in the accumulation area, and the summer direct and indirect precipitation at about 150·0 mm. If these same values be taken for the firn line, they would leave a theoretical deficit of about 45·0 mm. of water, which might be met either by excessive accumulation owing to the deposition of drift snow, or by excessive 1936 ablation. The former would seem a reasonable explanation since the glacier cap in the region of the firn line is often concave, encouraging the deposition of drift snow.

[1] In North East Land Angstrom estimated that 40 per cent. of the summer ablation was due to radiation and 60 per cent. to heat convection. This preponderant effect of heat convection was confirmed on the Isachsen Plateau of West Spitsbergen in 1934 by Sverdrup, who also found that ablation was greater when the air was warm and humid than when warm and dry, the effect of evaporation upon ablation being relatively small.

At the central West Ice station

Brandy Bay. Snowdrift glacier showing zone of excessive accumulation

Central West Ice station 21·5 m. below the surface

Main tunnel showing ice bands in firn walls

Central West Ice station, March 1936. Diagram of snow fallen during previous six months

Central West Ice station 21·5 m. below the surface

Main tunnel showing ice bands in firn walls

Central West Ice station, March 1936. Diagram of snow fallen during previous six months

There is thus estimated a summer ablation value of 380·0 mm. of water for the accumulation area, while a value of 500·0 mm. is computed for the firn line. In addition Ahlmann measured a sea-level figure in 1931 of 1400 mm. of water. The spacing of these values would seem reasonable, and they agree well with the actual observations made. The annual surplus for the accumulation area would seem to be about 75·0 mm. of water, while Ahlmann has estimated an annual deficit of about 100·0 mm. as an average for the ablation area, and of about 1200·0 mm. for sea-level.

While these values for accumulation and ablation can be applied to the glacier cap in general, attention must also be drawn to certain eccentric zones, which consist either of areas of excessive ablation (or deficient accumulation) within the accumulation area, or alternatively areas of excessive accumulation (or of deficient ablation) within the ablation area. The snowdrift glaciers around Brandy Bay, on the slopes of Mount Idun, and elsewhere are formed by excessive accumulation caused by the deposition of drift snow, and the same conditions bring about the deep snow drifts found in the windless zones on the glaciers flowing into Wahlenberg Bay. The small cirque glaciers in the North Cape region doubtless also benefit from the deposition of drift snow, but it is noticeable that all of them face northwards, as does the ice field on the north-east slope of Mount Franklin. Consequently radiation must be considerably reduced, and these glaciers might be classified as instances of deficient ablation.

It should be mentioned that in the windless zones on some of the glaciers flowing into Wahlenberg Bay, drift snow can accumulate to a depth of up to 10 metres. In the summer it melts from below, the melt-water draining off the glacier surface. Caverns are thus formed with thin treacherous roofs, which provide a particularly unpleasant obstacle to the progress of any sledge party.

The summer melting processes

Mid-May until mid-June.—The water from the thawing surface percolates downwards, raising the temperature of the snow below to 0·0° C. Subsequently alternating air temperatures often cause a negative temperature snow surface to overlie a layer of slush or snow at melting-point. The downward flow of the water will tend to be stopped by the thin crusts of ice layers in the snow cover. On meeting these crusts, the water will spread out horizontally, perhaps to be refrozen into a thicker ice band, or continue downward through some discontinuation in the ice layer.

The beginning of June until the beginning of July.—In the ablation area the downward flow of water continues until it reaches the glacier ice. There it accumulates until the gradient is such that a horizontal movement begins. This horizontal flow is the distinctive feature of the second stage of the melting process, and makes possible the invisible transfer of the thaw water from the sides of hills and valleys into the hollows and valley floors.

The beginning of July until the end of July.—The melting process, hitherto invisible, now becomes visible. The blue shadows which have been marking the hollows deepen in colour until the snow surface finally disappears revealing the lake below. The lakes increase their size until the ice walls can no longer sustain such a weight of water, whereupon the water bursts out and rushes to lower levels. The valley floors change from morasses into river courses, and the glaciers begin to play their part in drainage.

The beginning of August until the third week of August.—The visible but chaotic drainage system becomes regulated. Lakes are emptied and river and stream channels become well marked. The pattern of these scars the glaciers, many of the larger channels having been formed in previous years. Englacial drainage continues up to the highest parts of the glacier cap.

The third week of August until the end of September.—This final stage comprises the ending of the melting, except for that caused by isolated fluctuations in the air temperature during the autumn, and englacial drainage at considerable depths made possible by the delayed effects of the summer heat wave.

In these processes three melt zones develop on the glacier cap, spaced both as to time and altitude. The slush zone is the first to develop, and is also the highest. Its primary stage consists of the downward filtration of melt-water through the snow cover. The horizontal displacement of this melt-water, controlled by gradient, leads to the development of the second zone, the morasses, at somewhat lower levels. The lowest zone is that of the bare glacier ice, crossed by the countless drainage streams. This is the last to develop, and is also the lowest in altitude.

The increase in altitude of these zones can be very rapid. In 1936 the altitude of the morass zone rose from 100 metres to over 500 metres between July 20 and 26. Somewhat similar conditions were found by the 1924 Oxford University Expedition.

As the drainage streams pass through these different zones, their characteristics alter. As they flow from their heads in the slush zone into the morass zone, they string together the morasses, flowing between rather indeterminate banks of waterlogged snow. Where the surface of the glacier cap becomes convex, and drainage can be rapid, the morasses tend to disappear. The streams now come to the surface, flowing in shallow beds which are sometimes raised above the general surface level by flood banks. These streams are usually braided, dividing and rejoining without apparent reason, and often leaving one course for another, as is shown by the occasional dry deserted beds. As the slope increases and the bare ice zone develops, the streams unite again and entrench themselves to run with much increased vigour.

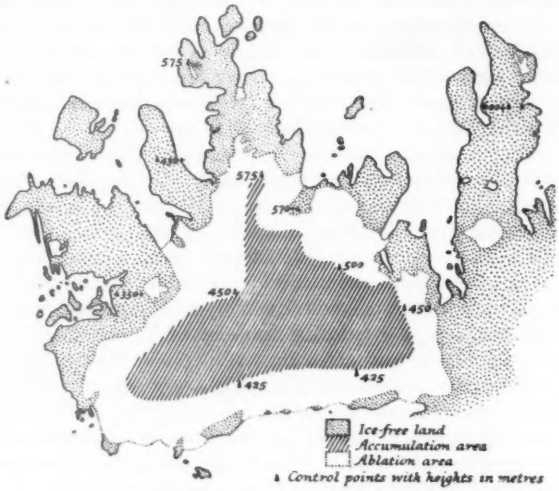
To the above general arrangement of the stream courses, there are of course many exceptions. Circumstances of slope and of snow thickness seem to be the controlling factors, and in those parts of the glacier cap which are "stepped" the three zones are often found occurring in series several times over. Despite such local variations however the general arrangement of the three zones and of the stream development can be said to apply to the greater part of the West Ice.

Physical conditions of the West Ice

The altitude at which the firn line is found varies surprisingly within the relatively small area of the West Ice. In the neighbourhood of the Franklin Glacier it can be placed with accuracy at about 450 metres, but at Mount Toil, only 10 miles distant, it has risen to about 575 metres. The same height holds good for Snoetoppen, which has a small accumulation area at its summit. Near Ivory Nunatak the firn line drops to around 500 metres, and to 450

metres on the eastern flank of the West Ice above the Rijps Valley. Above Wahlenberg Bay there is considerable local eccentricity, but the average altitude would appear to be between 400 and 425 metres.[1]

The firn line represents both the lower limit of the accumulation area, and the upper limit of the ablation area. Therefore theoretically at the firn line the total year's accumulation should equal the total year's ablation. Actually however there are two firn lines. The first represents that altitude at which previous climatological conditions have balanced accumulation against ablation, and at which the firn cover of the accumulation area is found to begin. The second represents that altitude at which any one year's accumulation and ablation may balance. This "temporary" firn line may vary very



Accumulation area of the West Ice

considerably from the "developed" firn line in accordance with the fluctuations of any one year's climatic conditions, it may not leave any permanent effect upon the glacier, but, if the climatic conditions which have produced it are continued, then the developed firn line will gradually conform with it. The direction of this trend, whether upwards or downwards, is the decisive factor in the deterioration or growth of a glacier cap at any given time.

As can be seen from the map the accumulation area of the West Ice is not large in comparison with the whole glacier cap. Moreover, as the average level of the developed firn line is about 500 metres and the maximum height of the glacier cap only 650 metres, it is not surprising that the accumulation

[1] In my paper "The glaciology of North East Land," published in *Geogr. Ann. Stockh.*, 1939, on pages 15 and 16 the firn line at Snoetoppen and Mount Toil should be at 575 and not at 525 metres, while the figure for the Franklin Glacier should be 450 instead of 430 metres. War conditions made it impossible to correct the proofs of this paper.

area has a balance of only about 75 mm. of water after the summer ablation. There is reason to believe that the altitude of the developed firn line may be rising in accordance with prevailing climatic conditions, and it can be concluded that the accumulation area is insufficient to make up the loss in the ablation area.

In describing the development of the accumulation area of the glacier cap, it is best to consider conditions in early June. By that time the year's accumulation at the central West Ice station had reached its maximum of 110 cms., and a vertical section revealed three main zones. The uppermost, the "snow cover," consisted of the year's accumulation since the previous summer, which by early June was 110 cms. in thickness. The middle zone consisted of firn crossed at intervals by horizontal ice bands. Its total thickness was about 7·5 metres, but the transition into the third zone, glacier ice, was not immediate, as, although practically all the firn had disappeared at a depth of 7·5 metres, at 8·3 metres a 2 cms. band of hard but unmistakable firn was found. It should be safe to conclude however that the thickness of the firn zone in the West Ice nowhere exceeds 10 metres.

The snow cover is made up of layers of snow, each of which may have been deposited under different conditions of wind velocity, relative humidity, or temperature. The material deposited may vary from the fragile structure of new snow falling under windless conditions to large particles of drift snow removed by wind from elsewhere. Radiation or thaw crusts formed in late August or early September occur at intervals, while wind crusts or wind slab are frequently formed throughout the winter, being separated from each other by the less dense layers originating from snowfalls under calm conditions. Meanwhile the density and crystalline development of the different layers gradually increases through the year. The most crystalline layer is that separating the snow cover from the firn below, and to this the description of "loose unconsolidated firn" has been given. This is the oldest part of the snow cover, and appears to be formed from the surface in August of the previous year, having therefore been exposed to some summer ablation.

The increasing altitude of the sun makes the effects of radiation felt in April, and positive air temperatures may be experienced in the accumulation area in that month or in May. In 1936 percolating melt-water was first found in the upper layers of the snow cover in May. As water percolates downwards, it will sooner or later meet either an old crust, or a relatively impermeable layer, whereupon it will tend to spread out horizontally until it meets a discontinuity in the crust, or until it succeeds in percolating through it. Fluctuations in the air temperature, which may be between 32·0° F. and −10·0° F. at this time of year, naturally cause corresponding but lesser fluctuations in the temperature of the snow cover. The melt-water will therefore be frozen at intervals, and ice bands will tend to develop in the snow cover, principally above impermeable crusts or layers. Seligman has pointed out that water tends to collect in fine, close-grained layers rather than in coarse-textured snow, and this was also found to hold good in the development of the snow cover of the West Ice.

There is some evidence that one main ice band develops in the snow cover, usually in the neighbourhood of the loose unconsolidated firn. Several minor

bands or thin layers are developed as well, and sometimes small lenticular pieces of ice, which may possibly be formed by the collection of water in the dense close-grained arches of one time sastrugi. In early summer the loose unconsolidated firn becomes part of the firn, while by the end of the summer most of the snow cover above has turned into firn. This change of the snow cover into firn would thus appear to take not longer than a year.

At the central West Ice station the density of the firn was found to increase rather irregularly with the depth from 0·35 gm./c.c. near the upper ice band to 0·6 gm./c.c. at a depth of 3 metres below it. At least three different types of firn were found, but several other differentiations doubtless also existed. "Crystalline firn" occurred only in the upper levels, and was composed of a firmly cemented aggregate of angular crystals, each of which averaged some 3·0 or 4·0 mm. across. "Soft firn" was found between depths of 0·75 and 1·75 metres, and formed a fairly coherent mass, made up of granules which had lost their angular form. "Hard firn" was somewhat similar in appearance to the soft firn, but was more highly compressed and more coherent. All the firn layers below 1·75 metres without exception were composed of hard firn.

At intervals the firn was crossed by horizontal ice bands, which varied in thickness from about 1 cm. to over 50 cms. The thickness of the ice bands increased irregularly with depth, until at around 5 metres the thickness of each ice layer exceeded that of each firn layer. The longitudinal development of the ice layers also varied greatly, some being only about a metre, others extending indefinitely. The lower horizons of the ice bands were usually straight, but the upper horizons could be extremely irregular, humped in one place into a thickness of 40 cms., and narrowing a few centimetres away to perhaps only 10 cms.

The origin of the ice bands is undoubtedly similar to that of the ice layers in the snow cover. It is not quite clear where the new main ice band forms, but it would appear to be in the neighbourhood of the layer that developed into firn from loose unconsolidated firn. Interruptions in the longitudinal developments of an ice band permit the thaw-water from above to pass to the firn layer below, and certain parts of an ice band can thus receive an exceptional supply of thaw-water. This would seem to be the reason for the variations in the upper horizons of these ice bands and for the occasional vertical "pipes" that are also found. Percolating thaw-water seems to have relatively little effect upon the firn through which it passes, and it is only when the firn above an impermeable layer becomes consistently sodden that an upward extension of the ice band can occur.

It is noticeable that all the ice layers that are formed in the snow cover do not persist in the firn. The main ice band increases its size, and a few of the other ice layers may occasionally be continued into the upper layers of the firn as very thin ice bands. In the lower levels these are seldom found, which would seem to indicate that the later crystalline development of the firn is sufficient to break them up. Furthermore, where the upper firn was entirely free from thin bands, it was known that the glacier movement was relatively greater. This would suggest that the horizontal crystalline movement of firn, which has been found by Seligman, may be sufficient to destroy thin bands.

The compression of the firn zone was measured at the central West Ice

station at depths of 1, 3, and 7 metres. The lowest rate of compression occurred at 3 metres, which would suggest that the firn has become more rigid at that depth than at 1 metre, but that with further increased depth the compression ratio again increases on account of the greater weight of the overlying snow. The values of the compression, using instruments 1·5 metres long centred at the depths mentioned above, were $4{\cdot}0\times10^{-5}$, $1{\cdot}90\times10^{-5}$, and $3{\cdot}10\times10^{-5}$/day respectively. The compression ratio appeared to be independent of temperature conditions. On the basis of the measured densities of firn and ice bands, the load above each indicator up to the mean surface level may be estimated as 95, 190, and 480 gr./sq. cm. respectively, so the values of the stress-producing unit compression per day are respectively $2{\cdot}33\times10^{9}$, $9{\cdot}81\times10^{9}$, and $15{\cdot}19\times10^{9}$ dynes/sq. cm./day. The ice-air complex thus becomes progressively less plastic with increased depth.

At the depth of 7 metres, where a compression value of $3{\cdot}10\times10^{-5}$ per day was measured, the firn zone mainly consisted of ice bands. On the basis of the compression ratio given, the density of the ice bands should increase by around 1 per cent. per annum, and, as these at a depth of 7 metres must have been of considerable age, there should be an increase in density towards the maximum possible of 0·92 gm./c.c. The density of ice bands however did not increase with depth but remained constant between 0·85 and 0·90 gm./c.c. Therefore the observed compression ratios must be caused almost entirely by the consolidation of the firn layers. This settling process, together with the effect of downward percolating melt-water in raising the upper horizons of the ice bands and thus in increasing their thickness, brings about the final change from the firn zone into fairly homogeneous glacier ice at a depth of around 10 metres.

The mean relative density of the glacier ice was thus 0·875 gms./c.c. which compares with a figure of 0·911 determined by Koch and Wegener in Greenland, and 0·880 determined by Mercanton in the Alps. As the thickness of the West Ice is not great, the maximum density would be expected to be much less than that of the Greenland glacier cap, and is in fact more similar to that of a Temperate than even of a Sub-Arctic glacier.

The temperature distribution in the accumulation area of the West Ice is also very different from that in the Greenland glacier cap. In 1934 Professor Ahlmann and Professor H. N. Sverdrup carried out successful observations on Isachsen's Plateau in West Spitsbergen, from the results of which Sverdrup concluded that melting in the accumulation areas could enable the percolating water directly and indirectly to raise the temperature at all depths to freezing-point. The results obtained at the central West Ice station are in agreement with this conclusion. They also show that the winter cold wave freezes the glacier to a depth which probably nowhere exceeds 20 or 30 metres.

The mean monthly temperatures recorded at different depths below the surface at the central West Ice station are given in the accompanying table. It will be seen that the temperatures at depths down to 1·01 metres reached their mean minimum in April, having fallen steadily since December, but that in May the first effects of the summer heat wave caused an upward trend. At depths between 1·01 and 7·16 metres, the mean temperature in May was the lowest recorded, showing that the winter cold wave was still predominant

Depth in metres	0·14	0·39	1·01	1·33	2·55	3·15	3·30	3·66
December 1935	−6·04°	3·82	2·98	2·83	1·54	1·26	0·79	[1·00][1]
January 1936	8·13	5·25	4·10	2·96[2]	2·03	[1·48][2]	1·21	1·23
February ,,	9·48	6·06	4·71	4·23	2·35	—	[1·34][2]	1·68
March ,,	11·64	7·45	5·79	5·25	[2·51]	1·96	1·60	1·94
April ,,	12·33	8·33	6·56	6·29	[2·92]	2·13	1·97	—
May ,,	8·82	7·17	6·17	6·37	3·13	2·36	[2·10]	2·29

Depth in metres	4·12	4·84	5·42	5·86	7·16	7·82	8·55
December 1935	−[0·65]	0·50	[0·39]	0·24	0·18	[0·04]	—
January 1936	[0·79][2]	0·75	[0·45][2]	0·37	0·33	0·16	—
February ,,	—	[0·85][2]	—	—	[0·38]	[0·17]	[0·12]
March ,,	—	0·99	—	0·60	0·39	0·09	[0·10]
April ,,	—	1·30	—	—	0·36	0·09	[0·14]
May ,,	1·85	[1·34]	0·99	0·67	0·48	0·34	—

Temperatures −°C. [1] Too high. [2] Too low. [ ] Less reliable figures.

Mean monthly temperatures recorded at different depths below the firn level at the central West Ice station

at these levels. At depths below 7·82 metres the maximum temperature variations lay between 0·10° and 0·14° C. The existence of a pool of unfrozen water at a depth of 20 metres or so in the crevasse, and temperature conditions therein, would appear conclusive evidence that the winter cold wave does not penetrate beneath that depth.

The greater part of the research carried out by the 1935–36 expedition was concentrated in the accumulation area, and relatively little was done in the ablation area. It had been intended that the density of the glacier ice should be measured at different altitudes from the accumulation area to sea-level. Unfortunately time did not permit this, but incidental observations were made which are of interest. The formation of ice layers in the snow cover and of ice bands in the firn has already been described. The method of formation of blue bands in the glacier ice is a debatable subject; some are certainly formed by the freezing of water which has filled crevasses, a process which was seen in September 1935 as by Sandford in 1924. Others may be sheer planes, and Seligman has shown that ice bands in the firn may persist as blue bands in the glacier ice.

The West Ice clearly falls within the category of a Sub-Arctic glacier. The accumulation area consists of crystalline firn, crossed by horizontal ice bands, down to a depth of not more than 10 metres. In winter and spring the temperature is negative to a depth of not more than 20 or 30 metres. Melting plays an important rôle, not only in the formation of ice bands, but also in the growth of these bands at the expense of the firn layers. This, with compression, brings about the transition of the firn into glacier ice at a depth of not more than 10 metres. The density and air pressure of the glacier ice are more similar to that of a Temperate glacier than that of an Arctic glacier.

The firn line is high, and the accumulation area is not large enough to nourish the whole glacier cap. The present accumulation/ablation balance

seems to be negative, and the West Ice thus to be in a gradually recessive condition, little movement occurring and the marginal areas slowly melting away in situ.

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THE TIGER'S LEAP

C. P. FITZGERALD

JUST over 100 miles north of the Burma Road the city of Likiang stands in the long loop of the Yang Tze. In the western arm of the loop, where the river turns to run almost due north, lies the great gorge between the snow mountains Ha Pa Shan and Yu Lung Shan, the gorge which the Chinese call Hu T'iao Chiang, the Tiger's Leap, and which, so far as it is known at all, is usually called the Likiang gorge by foreign travellers.

When I was living in Tali in 1937, I visited this place with Mr. Gerald Reitlinger and Mr. W. Hope-Johnson, who were on a winter journey through Yunnan. They had heard of the gorge from Dr. Rock of Kunming, who had visited it on more than one occasion during his long residence in Likiang. The winter is a pleasant time for a journey on the Yunnan plateau. The sun shines every day, and rain can be all but discounted. The air is cool and crisp at night, but warms up rapidly when the sun rises. After the wet season of late summer, when one must remain in the city and vicinity, cut off by mist-wrapped mountains, and washed-out roads, the clear skies and warm dry sun of early winter inspire an irrepressible wanderlust. So when Reitlinger asked me to go with them to the gorge and beyond, taking in the northern Min Chia districts of Kienchwan and Shihku, I accepted without a second thought.

It was decided that we should travel up to Likiang by the road through Kienchwan, which is one of the main caravan routes of northern Yunnan by which the tea goes up to Tibet. At Likiang we would decide on the best way to penetrate the gorge, for as is usual, no Tali muleteer had apparently ever heard of the place. This did not surprise me. Muleteers are practical men, working freight over a section of one of the great caravan routes. What should they know about some strange and inaccessible spot on the road to nowhere? There might be men who knew the gorge, and other such places, only too well, but these men would not be my choice as travelling companions. Men who know a district other than their own so well, know it for no good purpose. A Tali guide who knew the Likiang gorge would almost certainly be a bandit.

We started in the middle of December and reached Likiang in five days, the normal time for this stage. From Tali to Likiang the road passes through no scenery exceptional in Yunnan. There are only two passes, one between Niukai and Kienchwan, from which the first full view of the magnificent snow mountain is obtained; the other, the pass between the basins of the Mekong and Yang Tze above Likiang itself, from whence the plain stretches to the foot of the great mountain behind which lies the gorge. This mountain, not marked on Davis's map or on the Survey of India sheets, appears on one American map as "Satseto," a curiously Japanese sounding form, and is marked on a modern Chinese map as Yu Lung Shan, the Jade Dragon Mountain. In the opinion of Dr. I. A. Richards, who had just returned from a prolonged climber's reconnaissance of its icy peaks, it is not less than 20,000 feet.

It is sometimes also called the Likiang snow mountain by foreigners in Yunnan, and perhaps a word on these various names may not be out of place.

Snow mountain—Hsueh Shan—as the peak is called by Tali men (it is just visible from the Tali plain), is just a local name, the obvious and recurring local name for any mountain high enough to have perpetual snow in west China. Satseto is a corrupt version of a Yunnan dialect name pronounced in the Min Chia manner. It should be Shan Tzu Tou, "the fan shaped steep." Yu Lung Shan, the literary Chinese name which appears on official Chinese maps, is obviously the correct cartographer's name. On the other side of the gorge, unmarked on any map, rises Yu Lung Shan's only slightly lower rival, Ha Pa Shan, which Dr. and Mrs. Richards climbed in November 1937. The name, which has an un-Chinese sound, is possibly the local pronunciation of Han Po Shan, meaning Cold Slope Mountain.

Likiang city is a kind of Chinese Peshawar, without cantonments. The last administrative city of Yunnan, beyond which the country is ethnographically Tibet, whatever its political allegiance, it is a famous meeting place and market for the border peoples. Its narrow twisting planless streets, unlike the characteristic rectangular walled cities of Yunnan, are reminiscent of some south China city of Hunan or Kwangtung. It is, apart from one or two temples, without any buildings of distinction. Yet it has charm. Here one is on the edge of two worlds. Here the immense, integrated and age-old city and village culture of China meets and yields to the tent-dwelling nomads of the high grassland plateaux of Tibet. In Tali, a Tibetan nomad, fanning his grimy body against the "heat" of a mere 7000-foot plateau, is an uncouth and alien, if fairly familiar sight. In Likiang, much colder although only 1000 feet higher, the tall, high-booted nomads shoulder through the packed lanes with lordly ease. There are other races too. The Min Chia villages reach almost to the city which serves as their market town. The inhabitants of the city itself are Na Khi (or Mo So) a strange people with a culture and religion derived more from Tibet than China. There are also Li Su from the mountains farther west, smaller, rather furtive, timid-looking men with the light tread of those who never walk long on level ground.

Our immediate problem was to find, among this varying population, one reliable guide who knew the gorge and how to get there. In this, as in so many other matters, we were indebted to the kindness of the resident missionaries. Miss Scharten, a lady of a great Dutch family, who has chosen to exile herself in this far-off place in a lifelong endeavour to convert the Na Khi to the Protestant faith, was both well informed and helpful. She herself had a small out-mission station at Taku, a ferry on the Yang Tze just below the down-stream opening of the gorge itself. She and her assistant missionary ladies were accustomed to visiting Taku two or three times a year, preferably in the winter, for the village, lying in the deep valley of the Yang Tze at only 6000 feet, is much warmer than windswept Likiang. She was therefore able to give us information about the road to Taku and supply a guide, but she had never visited the gorge itself. The problem we were most anxious to solve thus remain unanswered. Was it possible to take horses through the gorge or was there even a foot-path of some sort passing through it? Opinions varied. Some said it was perfectly possible to ride through the gorge: others as vehemently asserted that one could not in any way enter it at all. Taught by some experience of the motives which influence a peasant's statements,

Likiang city

Street in Likiang

Village near Kienchwan

Yu Lung Shan from Likiang

The Yang Tze above Kiaotow. Ha Pa Shan peak in the background

Ha Pa Shan and north entrance to the gorge from Taku

we pinned faith to neither view. The muleteers, anxious for their beasts and feeling thoroughly at sea off a main caravan road, were the pessimists. My indomitable, excellent, and habitually opium-smoking cook, Ho, was the optimist. To Ho no road is impassable and none so steep that he feels called upon to dismount.

We finally left Likiang with the question no further advanced. At Taku, all agreed, the local men would know. There is no road from Likiang to Taku; travellers make their way across the plain below Yu Lung Shan and then across the northern spurs of the range, here covered with a far-stretching virgin forest of pine, ilex, and rhododendron. The total distance was said to be about 70 miles, but as we did it in two and a half days it is probably more nearly fifty. The *li*, the Chinese unit of measurement, in theory a third of a mile, varies in length with the roughness of the road. Our guide was a Tibetan boy from the mission, named Hua, who had the very unmissionary habit of drinking raw Chinese rice spirit straight from the bottle as he walked along. To the Chinese, who only drink at feasts, this seemed barbarous indeed. Hua spoke Chinese much as an African native speaks English, broken words with a wealth of gesture to help them out. Ho treated him with the kindly indulgence one might show to a pet monkey: an example of the true and ancient Chinese attitude to foreigners, still practised in the far interior to all from foreign lands, near or far.

It may have been the icy blasts which swept across the bare plain at the foot of the Jade Dragon mountain, or merely long practice, but Hua's indulgence in the bottle did not appear to produce any visible ill-effects. He guided us surely and well up into the trackless forest of spreading ilex and then down a breath-taking bamboo-clad slope, made slippery by thawing frost, to the rhododendron-edged banks of a rushing stream. The spot is called Paishui, the white water, and there are glades of grass among the rhododendrons where the horses could be grazed and tents pitched. It was the shortest day of the year and we camped out round a fire of rhododendron logs at an altitude of something over 10,000 feet. It was not cold out of the wind in the rain forest.

The whole of the next day the road wound up, over and along the interminable forested spurs of Yu Lung Shan, divided by powerful rushing streams. From time to time one caught fine views of the peak itself or of Ha Pa Shan, and we tried in vain to see just where the mighty Yang Tze could have forced its way between these two twin and seemingly conjoined snow-clad mountains. Taku we knew to be only 6000 feet, and Shihku above the gorge, not much higher. How then did the river pass through an apparently continuous range which is certainly not less than 19,000 feet high? There must be a gorge indeed.

At evening we came out of the forest where two or three Na Khi cottages, made of pine logs in a style reminiscent of Canada, crouched on the hillside beyond the last trees. These were the first habitations seen since the villages of the Likiang plain. The Chinese, hailing any building however unprepossessing with unfeigned delight, rejoiced to think that they did not have to camp out again that night, even under a perfectly adequate tent. We inspected the smoke-grimed interior of these hovels with less enthusiasm, and preferred

our tents pitched on a bare field across the road. The Yunnanese, although sometimes compelled to do so, loathe to "strike wild," as the local expression for camping puts it, literally translated. All their Chinese pride and urban-cottage background rises against what they feel to be the degrading custom of nomad savages. The Tibetan grasslander is too filthy even to be admitted to a Chinese inn when he visits the Yunnan markets. He camps outside the city walls. To do the same has, I think, in Chinese eyes a similar implication. So it was throughout the journey. Where any roof could be found, however small, choking with smoke and grimed with dirt the den might be, the Chinese all with one accord piled into it. We clung to our tents and endured the superior smiles of the paternal Mr. Ho.

Taku, which lies below the forest edge is nothing but six or seven Na Khi houses among a few sun-baked rice fields in the hot erosion valley of the Yang Tze. All round tower great hills. To the south-west the twin peaks of Yu Lung Shan and Ha Pa Shan still seemed one solid mass, in which, though not 5 miles away, one looked in vain for the opening of the Yang Tze gorge which must divide them. Below the village the Yang Tze ran in a deep slit 300 feet farther down, and it ran swift and clear as a mountain stream. " I will drink from it to-morrow," I thought, with memories of the last place I had seen the river, the murky yellow flood waters of Nanking. And on the next day I did.

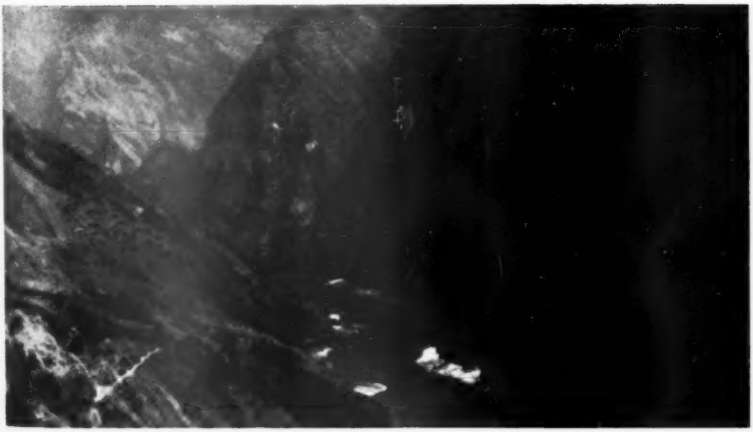
The inhabitants of Taku are a sun-dried, torpid race, their energy sapped by the close air of that deep walled-in spot. They could see no reason why one should go through the gorge. To reach Shihku, at the other end, they said, was much easier from Likiang, by the main road. No doubt; but was there a path through the gorge? " Yes," grudgingly, "there was a path, but it might have fallen in, no one had been to look." No one, clearly, was going to care. "Did people ever pass through that way?" "Yes, they did." "With horses?" "Perhaps, but it would be easier with horses to go round by Likiang . . ." and so on and on, with their wearisome inability to grasp the new idea that we really wanted to go through the gorge.

In the end we hired four Taku men to carry our baggage if, as at the last was still uncertain, the gorge path proved impassable to beasts. Perhaps, indeed probably, this was the result which the Taku men hoped to achieve by their evasive answers. They feared that if they said horses could pass through, we would not hire porters.

The river is crossed by paddling a long boat laboriously along the bank and then shooting down diagonally across the swift stream to the rocky cliff opposite, an operation not without risk when restive horses are among the passengers. After climbing on to the erosion terrace 300 feet above the river and going up stream towards the gorge for a couple of miles we had to camp near a tiny and extremely dirty Na Khi hamlet. It was still early in the afternoon, and we protested. Beyond the village we could see great pine forests sweeping up the flank of Ha Pa Shan. That was our road the next day, they said. Why not, then, go part of the way to-night and camp in the woods? I felt that the adamant and unanimous refusal of porters and muleteers alike was really due to nothing but the Chinese hatred of "striking wild." But they advanced a reason which no traveller can ignore. "There is no water there," they said,

The gorge entrance from Taku. Yu Lung Shan to the left

The Tiger's Leap. The Yu Lung Shan precipice



The middle stretch of the great gorge, looking down stream

Ha Pa Shan and the Yang Tze valley at Taku

The Yang Tze below the gorge at Taku

The ferry at Taku

"no water all to-morrow's ride either, till we strike it in the gorge." It seemed a most unlikely story. No water in Yunnan, that land of rushing streams? We yielded, but resentfully, and disbelieving. Yet it proved true. Except just after heavy rain there is no water on all the eastern slope of Ha Pa Shan, and very little in the gorge itself.

All the next morning we toiled up those pine-covered slopes, passing dry stream beds and found no spring. The climb was stiff and long, and when we camped for a late midday halt and still had no other water than what we had brought up with us, we did not regret our wisdom in yielding the night before. The place that the guides chose to halt for the midday meal seemed at first sight just another clearing in the pine woods with a spur of rock running down above it. The top of the mountain towered far out of sight above the woods, although we must now have been at 13,000 feet. So far we had looked in vain for the gorge. We had indeed when starting seen the opening like a great cleft made by an axe stroke in the solid chain of the mountains. We had then turned away into the pine woods and climbed so steadily that we had begun to believe that this famous gorge path passed along the side of the mountain above the gorge, and not through it. This might explain the contradictory Likiang stories, that one could ride through the gorge, or that it was not possible to enter it.

Hope-Johnson however had climbed up the spur through the trees, looked, and now shouted down to us eagerly. We scrambled up. There it was, at our very feet, sheer and terrifying the cliff fell away, surely a full 10,000 feet, to the white slit of the river foaming between dark walls of rock. Across the chasm, which on this side showed ledges and terraces here and there, the cliff was an absolutely unbroken drop from the snow-line of Yu Lung Shan, not less than 15,000 feet, down to the river soundlessly rushing over cataracts at 6000 feet. Looking up stream, the cliffs gradually diminished until at a distance of 20 miles or so one glimpsed the upper entrance. We saw now why we had climbed so long. From Taku there is no possible road between those monolithic gates of stone: the Tiger's Leap. Fantastic as the name appears it well expresses the dwarfed insignificance of the little silver thread which is all the mighty Yang Tze, really fully 200 yards wide, seems from that dizzy spot.

How wide the river really is in the gorge, we found no chance to judge. The path we followed all that afternoon and all the next two days, loops and climbs, descends breathtakingly wriggling down the face of a cliff or winds far up the slope to cut round a tributary ravine, but nowhere and never falls to within 1000 feet of the river itself. In this titanic landscape all sense of distance and judgment of size is overwhelmed. The gorge is not more than 20 miles long as the crow flies, but it takes three days to traverse it. The windings of the path made necessary by cliffs and ravines make the distance at least three times as great.

The track is rough and tortuous, but never impassable, and presents no real difficulty for horses provided they are led and unladen. The only danger which seemed real was the wind. It came suddenly roaring down the gorge like an express train till it rose to a crescendo of flying dust and small stones, then instantly was gone. When we heard these gusts coming, we waited

before passing the jutting corners on the cliff face round which it swept in full force. I noticed that the muleteers covered the horses' eyes with a cloth.

It was with real surprise that when we camped on a narrow ledge just wide enough for tents, we found round the next corner, to the delight of the Chinese, a wretched hut in which a Na Khi woodcutter lived. It was hard to see why any one should choose so grim a dwelling place and one so far from all amenity, unless, like the woman whom Confucius found lamenting over her son, slain by a tiger, it was because here at least there was no oppressive government. The woodcutter had chickens for sale and we dined on these, even the gorge wind being unable to prevent Ho from building a fire to roast them. The Taku Na Khi ate every scrap of their bird, guts included. Hope-Johnson watched them in the firelight, and murmured:

"How in the Alps he ate strange flesh, which some did die to look upon."

The second day through the gorge, at a turn of the road where the going was easier, we suddenly encountered a troop of armed and mounted men, their leader carrying an automatic pistol. The situation seemed equivocal. They were astonished, we were not unperturbed. Neither side could pass or retreat without considerable manoeuvring. If this was a hold-up, it was certainly well chosen. Ho hurried forward: bandits, or whatever they might be, were all one to him. He had the imperturbable superiority of the Szechwanese who has long lived in Yunnan, on a par with that of the Peiping man in the northern provinces. "Your honourable name, Sir?" he inquired of their leader. The chieftain bowed, replied, and soon all was as polite and formal as a banquet in Ta Li. He was, it seemed, anything but a bandit: on the contrary, he was the Na Khi *Tu Ssu* or local chief of Kiaotow, the village at the head of the gorge, and he was riding through to collect taxes. So the poor woodcutter had not escaped the government after all. That night we camped for the last time in the gorge, pitching the tent on the path itself for lack of any other level ground. Even so, we had to choose a corner where a waterfall splashed down, and during the night covered the back of the tent with ice from its wind-driven spray. It was Ho who suggested the road itself as a place to pitch the tent. "But what if any one comes along in the night?" we asked. Then he made a reply which was made to me once before in his native Szechwan where they build the inn courtyards right across the mule paths. "Honest men do not travel at night," he said.

Our last day in the gorge, when after many windings, we finally began to make direct progress towards the southern entrance, was almost an anti-climax to the fearsome cliffs of the Tiger's Leap. By any other than the overwhelming local standard, these southern approaches would be formidable and astonishing, but any one who wishes to visit the gorge should, for preference, enter by the long climb from Taku, as then the full tremendous gulf comes suddenly and quite unexpectedly into view. It is unfortunate for the traveller that this should be so, for the Tu Ssu of Kiaotow, in whose home we were next night royally entertained by his order, is the one man in the countryside who is really familiar with the gorge paths, and both able and willing to impart his knowledge and give his help. We should undoubtedly have been saved much tiresome misinformation if we had approached the

gorge from Kiaotow, but on the other hand the effect is incomparably more magnificent if the journey is made from Taku.

I am not competent to offer an opinion of value on the geological formation of the gorge, nor to explain the reasons why the Yang Tze should pass through the two highest mountains for many hundreds of miles, instead of continuing its south-eastward trend as do the Mekong and Salween in their parallel courses. Yu Lung Shan and Ha Pa Shan, like T'sang Shan at Tali, are almost detached mountains, very much higher than the ranges around them, but unlike T'sang Shan, which is an upthrust of granite breaking through the limestone formation of Yunnan, the mountains beside the gorge are themselves of limestone. The river terraces and erosion bed of the Yang Tze at Taku would indicate a long-continued process of cutting downwards by the river, but in the gorge itself, especially on the Yu Lung Shan bank, there are no terraces, only a sheer unbroken wall of blank rock.

OFFICIAL ROMANIZATION OF THAI (SIAMESE)

M. AUROUSSEAU

THE transcription of Thai into Western alphabets is difficult not only because tone and aspiration are such marked features of the language, but also because even in the popular speech innumerable words are not pronounced as they are spelled, and in that of the educated classes many words of Sanskrit and Pali origin are used. Moreover, many things have not names in the Western sense, but honorific titles, and the supposed names of some well-known places in Thailand are only parts of long titles selected for easy reference. The word *ayuthia*, for instance, occurs in the full titles of both Ayuthia and Bangkok. Even the terms which enter into the formation of geographical names share in this complication, 'mother of waters,' for instance, being written for 'river.'

Numerous attempts to romanize Thai were made during the nineteenth century (see O. Frankfurter, *J. Siam S.* iii, Pt. 2, *c.* 1906, p. 52), and the phonetic systems of the Roman Catholic and American Missions were successful, though they lacked the precision required for the rendering of personal and geographical names. The Royal Survey Department of the Siamese Government developed a system of its own, while the Court followed the Hunterian system as used in Burma and India. That of the Survey Department "was a real system, but it was not understood as it had never been explained. One had to learn three or four pages of explanation before one could pronounce a word of it." The results of the Hunterian system did not accord with the pronunciation of the language, and the Court had to make exceptions in the rendering of personal names.

Petithuguenin discerned a serious weakness of the systems, in the failure to reconcile hieratic with demotic practice, and in 1912 he proposed a dual system which would allow for the Sanskrit and Pali elements of the cultivated language and for the phonetics of popular speech (*J. Siam S.* ix, Pt. 3, 1913, pp. 1–9). He based his "literal transliteration" on the accepted romanization of Devanagari characters, while in his "phonetic transliteration" he tried to maintain continuity with the early work of Pallegoix and the Missions. King Vajiravudh was at that time developing a dual system for use in the Court Circulars, and submitted his work to the council of the Siam Society for consideration (*J. Siam S.* ix, Pt. 4, 1913, pp. 1–10). The council thereupon appointed a committee to "report about the various schemes" and on "the feasibility of adopting a system of romanization for the publications of the Siam Society." It may be noted that the dual systems of Petithuguenin and King Vajiravudh anticipated the 'broad' and 'narrow' transcriptions now considered necessary by the International Phonetic Association for the adequate phonetic treatment of any language.

The committee made a report and recommended a phonetic system in 1913 (*J. Siam S.* x, Pt. 4, 1914, pp. 1–21). The system was severely criticized by the king (*ibid.*, pp. 25–33), who raised the fundamental objection to all sound-for-sound systems: the importance of regional differences in pronunciation. He pointed out that Siam would need three transliteration-

tables, one for the Bangkok region, another for the north, and a third for the Malay peninsula, if local pronunciation were to be taken into proper consideration. He also discussed the way in which words lose their identity when written phonetically, and he drew attention to the inconvenience of discarding the established but conventional forms of the names of well-known places. In view of his opinion the council "resolved to make no recommendation in the matter of Transliteration." Meanwhile, the Royal Survey Department continued to use its own complicated system, which it extended to the Siamese sheets of the *Carte du Monde au millionième*.

In 1931 the Minister of Public Instruction appointed a committee "to draft a uniform system of transcription from Siamese into Roman characters." A compromise between sound-for-sound and letter-for-letter transliteration was recommended (*J. Siam S.* 26 (1933) 218A–231) on which the minister invited public criticism. The Siam Society itself made further recommendations (*J. Siam S.* 28 (1935) 19–35); and the Ministry of Defence set up a committee of its own to consider the subject.

In 1934 the Royal Institute took all the work in hand, consulted the Ecole Française d'Extrême-Orient, and, after examining the methods of the International Phonetic Association and considering the limitations of typography, laid down a dual system of general and precise transliteration, of which the rules have just been promulgated (*J. Thailand Research S.* 33 (1941) 49–65). The general system "is to be applied in case it is desired to facilitate pronunciation by foreigners, without intention of indicating the unpronounced letters or tones," and uses no signs not carried on a typewriter equipped with the commoner diacritical marks. The precise system "is to be applied in case it is intended to indicate the unpronounced letters with a view to showing the derivation of the words and their tones" and uses no signs which would strain the typographical resources of a good newspaper. In short, it seems that Thai words may now be satisfactorily transcribed into Roman characters, either as they are spoken or as they are written. Some time must pass before the effect of the new system on the writing of geographical names becomes apparent, but we may expect to see the results of precise transliteration on official maps, and those of general transliteration in the newspapers. Official and popular forms of well-known Thai names may eventually have to be recognized. Meanwhile, the transliteration of the Royal Survey Department is the most appropriate for use (*Siam: Royal Surv. Dept., Gen. Repts.*, 1909–10, *passim*), and all lists of names published as examples of transliteration, other than those of the Survey Department, should be rejected.

As the languages of the Thai group are very much alike, the recent publication of a romanized dictionary of one of them, in a narrow transcription resembling that of the Royal Institute, is most opportune. Attention is therefore drawn to Georges Minot's "Dictionnaire tăy blanc français" (*B. Ecole Française d'Extrême-Orient* 40 (1940) 1–237).

A STUDY OF THE MIN CHIA

THE TOWER OF FIVE GLORIES: a study of the Min Chia of Tali, Yunnan. By C. P. FITZGERALD. *London: The Cresset Press*, 1941. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* vi+280 *pages; sketch-maps and illustrations.* 16*s*

A LEVERHULME fellowship gave Mr. Patrick FitzGerald the opportunity of making an intensive study of the Min Chia of Yunnan. The result em bodied in 'The tower of five glories' gives a fascinating picture of a sturdy peasant culture in one of the most beautiful regions of the world, almost as unvisited as Tibet. The Min Chia are culturally the most advanced of the non-Chinese-speaking peoples of Yunnan; their language appears to be unrelated to Chinese or to the indigenous Yunnanese tribes, though it has been much influenced by Chinese and absorbed a considerable element. The country was brought into the Chinese Empire by Kubla Khan and has remained a part of it ever since, the people keeping an individuality of their own, yet without any sense of nationality and with complete political fusion.

The main concentration of the population is on the plateau bordering the Lake Erh Hai, with its city of Ta Li, by which the Burma Road passes. Though inhabiting a country where the lake plateaux and valleys are at an altitude varying from 6000 to 8000 feet and the intersecting ranges from 10,000 to 14,000 feet, the Min Chia are not mountaineers, they are rice farmers, not hunters, and never venture into the mountains unnecessarily.

Rice is the standard of wealth and the only crop deemed really important; it is used entirely for home consumption. Opium was cultivated considerably for export until its suppression by the present government. Although the suppression has caused economic hardships, reacting on land values and the fairs, which play an important part in Min Chia economics, the policy has been carried out successfully.

The government have been relentless in attacking banditry, which has been practically abolished, though with an inverted Robin Hood mentality people often turn bandit at the end of the lunar year in order to pay their New Year debts. This behaviour is however paradoxical as the estimation of a bandit is intimated linguistically in Min Chia by its grammatical classification with the lower animals.

On the silk route from Ssu Ch'uan to Burma and the tea route from Yunnan to Tibet, politically incorporated into China, with a considerable resident element of Chinese and Muslim Chinese in Ta Li, the Min Chia have been sufficiently isolated to have maintained a cultural unity of their own. They have no tradition of immigration, but FitzGerald indicates certain cultural affinities to the Shan.

The study of the Min Chia is a study of "acculturation" though the author avoids this uncouth word. The Chinese respect for learning has been adopted and, though predominantly a peasant people, the Min Chia have produced an educated class, who have duly become officials. Chinese religious tolerance is the rule and the "three religions" are adopted, but with a change of emphasis. Buddhism resolves itself into a worship of the best-known Bodhisattvas, chiefly Kuan Yin. Worship at the temples is practised mainly by women. Ancestor worship, which takes place in the home, is the concern of men, though women are not excluded; every house has its ancestral altar, the tablets are regarded as resting places of the spirits of ancestors and treated with the courtesy due to parents and grandparents. Various local spirits have their ritual and festivals,

some of them unknown to the Chinese, and most forming an occasion for a picnic and a holiday.

Bodhisattvas, Taoist deities, local gods, and ancestral spirits are all described as *ser*, while ghosts of deceased persons are *gur*. Visits to the graves of ancestors are made in the third lunar month; girls carry out rites for the ancestors in their mothers' families. These visits are family reunions and the atmosphere of the picnic prevails. The Kings of Nan Chao in the sixth and seventh century erected fine pagodas which still exist, but it is doubtful whether even at that period Buddhism entered more deeply into the life of the peasants.

There is a complete absence of belief in were-foxes, so common in other parts of China and in Japan. There is however a belief in possession by malevolent ghosts or demons, who can be exorcised by experts called *Sai Der*. The *Sai Der* live ordinary peasant lives and usually inherit their function from their fathers and teach their lore again to their sons. There is a good deal of mystery surrounding the rites and the practices are discouraged by the government.

The Min Chia have never adopted exogamy; the village group is not a kinship group. The original founder is revered as the *genius loci*. The social group is thus formed by the patrilineal families combined in unrelated territorial units or villages, worshipping its founder. The joint family is the ideal as among the Chinese, but on the death of the father, married sons usually divide the property and set up separate establishments. Education forms a tie nearly as binding as the family: those Min Chia who pass through middle-school form a group which may last throughout life.

There has never been any foot binding; betrothals are made in infancy by the mediation of recognized but unpaid match-makers. The betrothed are never allowed to meet. Bride-price is regarded as a consolation to the parent and more is given for a girl who has been educated. The Chinese uncompromising attitude to pre-marital chastity is adopted, and seduction of an unmarried girl is a crime. However abduction is a recognized form of behaviour when an unbetrothed couple fall in love. After the ensuing quarrels have been patched up, exchanges of gifts take place and the marriage is legalized.

Enough has been said to indicate the scope of this very readable book. It is illustrated with excellent photographs and there is a Min Chia English vocabulary.

BRENDA Z. SELIGMAN

REVIEWS

EUROPE

WALES, a study in geography and history. By E. G. BOWEN. *Cardiff: Univ. of Wales Press Board*, 1941. 7½×5 *inches;* xvi+182 *pages; maps, diagrams, and illustrations.* 3*s* 6*d*

This is a book intended for the senior pupils of secondary schools and for students in training colleges or in the first year at the university. It will be read with interest and profit by a far wider public. The emphasis throughout is upon the analysis of the human and cultural landscape in its relation to physical, social, and political conditions at selected stages or culture-periods in the history of Wales. It is therefore a historical geography, an exposition of the changing personality of Wales.

The outline of the topographical features (part I) is largely descriptive; geomorphology finds little or no place in this account of the geography and history of Wales. Part II describes the social, economic, and political life of Wales during important epochs in her history. It helps us to understand how firmly the traditions of the Welsh people are rooted in the past and how these peasant traditions were adapted to, or were modified by, the new industrial environments of the north and south Wales coalfields in the nineteenth and twentieth centuries. The author discusses *inter alia* the old tribal society of the Welsh, the political amalgamation of England and Wales, the divorcement of peasantry and gentry, catholicism and nonconformity, as essential features and products of the changing cultural landscape. One inheritance of the past seems to have been somewhat neglected, namely, the maritime tradition of the coastal districts of Wales. Nearly a half of the book is devoted to a survey of the industrial era in its historical and economic setting. This is comprehensive in treatment and gives a vivid picture of the social, linguistic, and cultural geography of modern Wales.

The work is excellently produced. There are over fifty pages of sketch-maps and diagrams, models of clarity and simplicity, and a number of well-chosen, full-page photographs. In some places the text is marred by complicated sentence-structure and by the irritating repetition of the same word. This is unfortunate in a book written as a geography reader for secondary schools.

D. T. W.

THE LAND OF SAINT JOAN. By OWEN RUTTER, with fourteen wood-engravings by AVERIL MACKENZIE-GRIEVE. *London: Methuen*, 1941. 8½×5½ *inches;* xii+266 *pages; end-paper sketch-maps.* 15*s*

This is an interesting book describing a journey across France, in which are reconstructed the journeys and campaigns of Joan of Arc. It must be confessed that in places the traces of the Maid were almost lost, but the author and artist persevered, and it is a pleasure to have a book on France which shows such a real understanding of the people. Towards the end the pilgrimage became a race with time, for the travellers must have been among the last to leave before France's declaration of war. The country people, who had already known the horrors of invasion, were gravely disturbed. Tension was growing daily. The crops were left unharvested as the men were called to the colours, and Mr. Rutter was not the only traveller hurrying to the coast who felt that he was unwanted. One wonders what has happened to the kindly homely folk whom Mr. Rutter describes so well. Reading his book one cannot fail to be impressed

by the speed with which the notion of English invincibility was dispelled by Joan of Arc, whereas nothing could break the spell of inertia which bound the French Court. Mr. Rutter has written a book which has assumed an importance which he did not foresee, for some part of the old spirit of France is enshrined in it. The wood-cut illustrations are interesting and clever, but are perhaps a little too severe for the book. M. L.

ASIA

MODERN TURKEY. By JOHN PARKER and CHARLES SMITH. *London: Routledge*, 1940. 9×5½ *inches;* x+260 *pages; sketch-maps and illustrations.* 12*s* 6*d*

This is a welcome book in the present time when Turkey has become a pivot of the war and stirred public interest in her important strategic position, political tendencies, and economic resources. The remarkable rejuvenation of the country under Kemal Ataturk is also a chapter in history worth reading for its own interest. 'Modern Turkey' shows that the once "sick man of Europe" is dead and a vital new independent state has been created, not Utopian, but with much to teach others.

The book should appeal alike to the man in the street, who wishes to enlarge his knowledge in general and his insight into current events in particular, to the geographer in search of a good up-to-date background for more detailed information, and also to the student of history, politics, and social reform. Within 230 pages it has proved impossible to give more than a general outline of a country so large, diverse, and transformed as Turkey, but the book is very comprehensive. The description of the decadent Ottoman Empire forms a vivid contrast to the driving force of Kemal and the detailed achievements, political, economic, and social, of the new Republic. It is extremely doubtful however if even the latter can increase rainfall by planting trees, as the authors confidently assert (pp. 85 and 89). This is a very moot point and proof of climatic change seems entirely lacking in the newly afforested areas near Ankara. It is a pity that chapters IX and X (Foreign Policy, and Military Power and Strategy) are mainly out of date owing to the rapid developments in the Middle East, but inferences can still be drawn.

Facts and statistics about Turkey are still hard to obtain and rarely reliable, as the authors admit, but they have tapped most sources profitably (except, apparently, the *Annuaire Statistique*, 1938), and they have valuable first-hand information. The photographs are good, but a few sketch-maps and diagrams, to supplement the two maps given, might have been helpful, and a distinction might have been made in the text between the port and inland town of Ereğli. There is a useful annotated bibliography, an appendix of the People's Party Programme, and an index. M. J. B.

AFRICA

CONGO DOCTOR. By W. E. DAVIS. *London: Robert Hale, Ltd.*, 1941. 8½×5½ *inches;* i–viii, 9–286 *pages; illustrations.* 12*s* 6*d*

This is a chatty book about one small region in the Belgian Congo, the area round Coquilhatville. The author (an American missionary doctor) says, rather ingenuously, "When I say Africa or African or Central African or Congo or Congolese, or use any other general term, I am referring to that particular part of the country or its people."

Although it is written in a colloquial American style, one realizes that an enormous amount of hard work and cheerful care of the native peoples is

described in a rather airy fashion. It is curiously limited in outlook, but Congo forests are so vast and overwhelming that this may be a normal result of living in them. The utter lack of all apparatus considered essential for operations in civilized lands, the discomfort of rain and swamp, queer food and queerer beasts, the heedless, happy-go-lucky black people, whose own primitive gods and witch-doctors were behind all they did: all these are described vividly. Nothing seems to have upset the doctor seriously, not even the smells.

The outlook is that of an American missionary, whose knowledge of Africa before he got there was very small indeed. One hardly realizes after reading the book that the Basin of the Congo is a vast Belgian Colony. The narrative is besprinkled with remarks in the native tongue, always with the translation beside it. There are some reasonably good photographs. The book is racy, but superficial, amusing to read, but not a serious contribution to the geography of the Belgian Congo. A. B.

NORTH AMERICA

SEA OF DESTINY: the story of Hudson Bay. By H. DYSON CARTER. *London: Hutchinson*, 1940. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 224 pages; illustrations and diagrams. 10s 6d*

The author, whose preface is written from St. Boniface, Manitoba, maintains that "Canada can be smashed into helplessness at one blow" delivered from Hudson's Bay; that Canada cannot defend the bay, "and if Canada could, *she would not*. Hudson Bay has been forgotten with a purpose"; that rival commercial interests "gave birth to the legend that distracted attention from the Bay"; and that "down the years, the fight to kill Hudson Bay passed from murder to politics, then back to desperate sabotage." It will be apparent that to review large parts of this book is no business of a scientific journal; but we may examine one proposition, to see if the author is prone to exaggeration. On p. 147 we read "The waters of the Gulf of Mexico and Hudson Bay are separated by only a few hundred miles of unbuilt locks and reservoirs. Future builders with bold plans and the energy to fulfil them will join the Bay and the Gulf with three thousand miles of flowing highway to carry the fruits and cotton of the south up to the Arctic's rim and bring back fish and minerals in never ending commerce." This plan is illustrated on p. 19 by a very crude sketch-map in which "The Routes of the Raindrops" are distinguished with difficulty from political boundaries.

Some 290 miles south of the city of Winnipeg and 165 miles W.N.W. of Minneapolis the water of the Red River issues from the long Lake Traverse, joins the Saskatchewan river in Lake Winnipeg, and runs as the Nelson river to Hudson Bay. Five miles from the southern end of this lake is the head of Big Stone Lake from which the Minnesota river flows to join the Mississippi between Minneapolis and St. Paul; and the Little Minnesota river, flowing into the head of Big Stone Lake, passes within a mile of Lake Traverse. A cut of a mile would then join the waters of the Gulf of Mexico and Hudson Bay, at nearly 1000 feet above sea. But that is not to say that a navigable channel could be made, or would be worth making, through the complicated waterways of a recently glaciated plateau. The author gives no reference in his extensive bibliography to any study of such a project. But a report on the Water Powers of Canada published at Ottawa in 1916 is explicit on the rapids of the Nelson, which "is more properly described as a chain of lakes connected by falls or by reaches of river and rapids; in the upper section the falls are more sharply defined and usually of steeper descent than are found in the lower reaches, and are often separated by islands into numerous narrow channels." In the 390

miles from Lake Winnipeg to Hudson Bay the report gives nineteen possible power sites with heads of from 17 to 52 feet.

On the Canadian map of 3 miles to the inch the head of navigation on the Nelson is placed at some 50 miles above Port Nelson at its mouth. In the stretch of 100 miles below Split Lake the river falls 350 feet, and the notes of muskeg and tamarack swamp on each side do not suggest an easy foundation for canals and locks. One can find no maps which give any soundings in the lakes, either on the Nelson, along the 250 miles of lake Winnipeg, or on the 350 miles of the Red River to Lake Traverse and the watershed at least 1000 miles from Hudson Bay. But it seems that our author may have exaggerated the ease with which a trans-continental waterway could be made from Hudson Bay to the Gulf of Mexico, and we may hope that some of his judgments on the other matters with which he deals are not to be taken too seriously.

THE ESTABLISHMENT OF CONSTITUTIONAL GOVERNMENT in Newfoundland 1783–1832. By A. H. McLintock. (Royal Empire Society Imperial Studies, No. 17.) *London: Longmans, Green and Co.*, 1941. 9 × 5½ *inches;* xvi + 246 *pages; sketch-map and diagrams.* 15*s*

The constitutional history of Newfoundland is particularly tangled. The settlement did not, in the strict sense, become a colony until 1824; it was governed by a naval officer who each year spent a few weeks only in the island, and who possessed no legislative power; until the end of the eighteenth century there was no permanent resident judicature with a legal basis, and moreover no indefeasible title to land; the interests of the transient fishermen, the west of England merchants, and the resident population were in continual conflict, and to confuse further the whole position there was the international rivalry with France. Dr. McLintock's study, based upon primary sources mainly from the Colonial Office records, only recently made available to research, provides a clear explanation of these conditions and of the manner in which the problems were eventually solved. The problems arose not through want of a definite policy or vacillation on the part of the English authorities, but through the obstinate application of a theory in its extreme form. The island was regarded merely as a station for the annual fishing fleets, which were carefully fostered as a nursery for seamen. To prevent the establishment of a local industry, or the intervention of foreign fishermen, by which men and profits might be lost to England, everything possible was done to prevent wintering in the island, the erection of permanent buildings near the shores, and the cultivation of the land. This negative attitude to settlement arose also from the extreme application of mercantilist theories. In addition to providing a reserve of seamen for the navy the Newfoundland fisheries were the basis of a valuable triangular trade, vessels left England in the spring for European countries where they obtained salt and staves for casks: thence they left for Newfoundland to collect the dried fish and oil, which they then carried to Mediterranean countries, finally returning home with wine, oil, and the highly coveted bullion. It is little wonder therefore that the west of England merchants were wholehearted supporters of the naval officers in resisting the growth of permanent settlement. Despite the obstacles the wintering population gradually increased, particularly during the wars of the late eighteenth century, which led to the decay of the transient fishing fleets, and the independence of the United States. The stages in progress from the negative attitude embodied in the Act of 1698 to the recognition of colonial status and representative government are clearly set out here; the author writes with restraint and states both sides fairly. Though his main concern is with constitutional problems, he keeps their relation to social and economic con-

ditions in the forefront, and spares some lines to portray the personalities of the leading figures in this extremely revealing chapter of imperial history.

G. R. C.

AMERICAN GUIDE SERIES. Pennsylvania: xxxii+660 *pages*. South Carolina: xxxii+514 *pages*. Wyoming: xxviii+490 *pages*. *Oxford University Press*, 1940–41. 8×5½ *inches; illustrations and maps*. 15*s* 6*d each*

These three recent volumes of the American Guide Series cover a well-contrasted group of states, representative of New England, the South, and the western mountains and plains. Being essentially concerned with topography and travel, the geographical information they contain is largely scattered through their pages, but the introductory sections give a good if brief indication of the main geographical, economic, and social characteristics of each. Though the product to some extent of local patriotism, an effort is made to deal fairly with all aspects of their past and present. Wyoming, the youngest of the States, having recently celebrated the fiftieth anniversary of its creation, has scarcely left the pioneering stage, and water and grass remain its primary resources, despite the development of the oil industry and its rich potential supplies of minerals. Cattle, horses, and sheep preserve the atmosphere of frontier days, and this aspect of life is evidently well exploited for the benefit of the visitor, to whom the Yellowstone National Park is an additional attraction. Despite the lateness of its development, problems of conservation have already arisen, and some account is give here of the measures taken to preserve the ranges and the supplies of irrigation water. These have been simplified by the fact that less than half of the land is now in private ownership. Though Wyoming is largely rural, one-third only of its population live on ranch or farm, the remainder in small settlements, two only of which have more than fifteen thousand inhabitants. The contrast with the eastern states does not require to be underlined. Both Pennsylvania and South Carolina have comparatively long and eventful histories; the latter especially is concerned with problems rooted in the past. The varying fortunes of the cotton grower are outlined succinctly here, and it is apparent that cotton will take a decreasing place in the State's life. The cotton textile industry, now the largest in the country, makes greater demands on raw material than can be supplied locally. Problems of soil fertility, particularly the use of commercial fertilizer which cannot replace humus or bacteria, and general economic conditions are against any attempt to maintain the area in cotton, and it is stated that the future of agriculture, whether the farmers like it or not, must rest upon cattle, grass, and legumes. In this respect the recent growth of truck farming is important. Industrial production, now of greater value than the agricultural, is bound up largely with the supply of hydroelectric power, for which conditions are favourable, and to which the development of the textile and pulp industries is due. In the foreground are the problems of the negro population. For the first time since the census of 1810 there were in 1930 more whites than negroes in the State, owing to the migration of the negro elsewhere. As this exodus has been more marked among the more prosperous, it has aggravated the social and economic position of those remaining.

Though the sketch of Pennsylvania is essentially that of a great industrial and manufacturing region, there are other contrasting aspects. Some of the most productive farmlands of the Union lie close to the mining centres, and the way of living of the many nationalities which have contributed to the present population survive alongside the cosmopolitan life of the great cities. All the volumes have excellent illustrations and road maps.

THE MONTHLY RECORD

METEORITIC IRONS AND A CRATER IN GREAT NAMAQUALAND

In the *Mineralogical Magazine* for June 1941 Dr. L. J. Spencer discusses the rich shower of large meteoritic iron distributed over an area of several hundred square miles in Great Namaqualand, South West Africa, and gives a photograph of a pile of some thirty pieces, weighing about 10 tons in all, which have been collected in the public garden at Windhoek. Others have been carried away to Germany and America, and there is one fine example of 299 lb. in the British Museum. The richest distribution is round Gibeon, but there are others which came from 100 miles farther south, from Bethany and the Lion river. In the middle of this meteorite region is the large crater of Geitsi Gubub, rising 1800 feet above the plateau, 1·3 miles across, with a flat bottom 1500 feet below the highest point of the rim.

The crater has been described by Dr. A. W. Rogers in the *Transactions of the Royal Society of South Africa*, 5 (1915) 247–58, with a sketch-map and a section. It stands on red sandstones and shales of the Fish river series, but is itself composed of breccia with small fragments of rock of many kinds cemented with "quartz and dusty stuff." The floor of the crater is flat, covered with debris washed down from the walls, and a well has been sunk which produced soft gritty material like the walls but without the cement. The horizontal beds of the plateau are bulged up into a slight anticline surrounding the crater.

In discussing this remarkable crater Dr. Rogers compares it with Coon Butte in Arizona, but was not prepared at that time to accept the view that the latter is an explosion crater formed by the impact of a meteorite. Of this there is no longer any doubt, and since the date of Dr. Rogers' visit much has been learned of the criteria by which such craters may be distinguished, from the studies of Dr. Reinvaldt at the crater near Kuresaare on the island of Oesel, and of Dr. Spencer on the silica glass brought from Wabar by Mr. Philby. One may hope, then, that a further examination of Geitsi Gubub will some day be made, in the light of present knowledge.

LAGO DE VALENCIA BASIN, VENEZUELA

The changes in the exploitation of the basin of the Lago de Valencia, one of the most fertile regions of Venezuela, are described by R. E. Crist and C. E. Chardon in the *Geographical Review* for July. It lies in the centre of a large depression, about 3000 km², probably downfaulted between the coastal ranges and those of the interior. The mountains north of the lake are pre-Cretaceous schists; these also underlie the lake, and, containing much ferruginous matter, stain the soil a deep red. Around the lake there are recently formed peat and alluvial deposits of sand and gravel. About half the cultivable land around the lake, of good quality, became national property on the death of President Gomez in 1935, and is thus available for large-scale planning, the necessity for which will be apparent later. The region has a savanna type of climate with definite wet and dry seasons. At the end of the dry season the peasants pursue the traditional policy of burning the fields and pastures, which though temporarily adding certain minerals eventually leads to a deficiency of nitrogen. Corn is planted in May at the beginning of the wet season, and in July cotton is sown between the rows. The latter, with beans and melons, is gathered in December, some months after the corn; new plots are cleared, and the routine begins again with the burning. During the Spanish period the whole region was cultivated intensively: coffee, sugar, cotton, and cacoa were grown on the haciendas largely

worked by slave labour, the forests were destroyed, and much water drawn from the rivers for irrigation. With the wars of independence and the freeing of the serfs this era of prosperity ended for a time, and the natives reverted to subsistence farming. Later, fluctuations of prosperity took place and at the beginning of this century large-scale production of high-quality coffee and cacoa was re-established, but this revival was ultimately checked by the competition of the British and Dutch tropical colonies. Under Gomez much land was turned over to cattle ranches. The most recent development however has been the rivival of cotton growing with the decrease in American competition. By the introduction of selected varieties of the upland type and the use of machines and insecticides, Venezuela is now supplying its domestic requirements, and the centre of this production is the Valencia lake area. It is thus important that the future of the national property should be carefully planned. Recently some of the larger estates were subdivided into small holdings, but for want of a definite policy and guidance this has failed, leaving the peasants struggling for existence, and raising the cost of food-stuffs to the public through inefficiency and the intervention of middlemen. The writers suggest that the solution lies in expert management and large-scale mechanical working where possible. In such a plan three zones require consideration. The belt of peaty soil along the lake is unsuitable for farming by machines, and should be left to small farmers growing tobacco, bananas, and vegetables. Unfortunately it is an area in which malaria is very prevalent. The next broad zone of flat, fertile land should be employed for the growing of crops on a large scale and for modernized dairy farming, and the lower slopes of the hills divided into larger subsistence plots, on which fruit trees and vegetables would thrive. The holders might supplement their incomes by picking cotton on the larger farms nearby.

It is noted that the changes in the use of the land have been reflected in the level of the lake. At the beginning of the last century it was falling, and this was attributed by observers to the diversion of water for irrigation and to forest destruction. During the revolutionary period when agriculture decayed the level rose, to fall again with the revival of the later nineteenth century. In 1921 the lake level was 413 metres above sea-level, and, by 1933, 407·6 metres.

THE BIPACK PROCESS OF COLOUR PHOTOGRAPHY

After the very successful show of Mr. Lawrence Thaw's Indian film in colour, which by the courtesy of the Director of the Imperial Institute was given to the Society on May 26 last, we wrote to Mr. Thaw asking for details of the process, which was unfamiliar to us, and are grateful to him for the following reply. The process is Bipack and the name signifies that two negatives are made by running together through the camera two films with their sensitive faces in contact. The front film is of regular orthochromatic stock dyed red and records the blue-green; the back film is panchromatic stock which records red only since the red dye on the front film keeps the blue from the back negative. Any standard-size camera will handle the double negative with an adjustment of the gate and special magazines. The red dye is removed from the front negative during development and the two negatives are printed on opposite sides of a double-coated positive stock, of which one side is then passed through a blue dye and the other through a red. This gives the advantage of control in the processing since the two colour prints are made independently and the exposure and the strength of the dye can be varied. It has the disadvantage of any two-colour process that it cannot produce a complete colour rendering. A second advantage is that perfect black and white prints can be made from the front negative. There is sometimes difficulty in maintaining perfect register of the

two negatives in the camera or in the printer, but in the films shown to us there was no evidence of the red or blue ghosts of the image which may be caused by want of register.

In the camera the light has to pass through the celluloid base of the front negative before it falls on the sensitive film, and this not only involves an adjustment in the focussing, but must to some small extent diminish the sharpness of both images on the sensitized surfaces, which are however in contact. In the positive on the other hand the two images are separated by the thickness of the positive stock and cannot both be projected in strict focus. One cannot say that there was any serious want of sharpness in the 35-mm. film shown to us, but one may suppose that the defect would become serious if the process was applied to 16-mm. film, since we have noticed in projecting the latter, with the long throw required in our own hall, that the picture is sometimes thrown out of focus even by the minute variation in the thickness of stock from one section of the film to another, and this variation must be very small compared with the total thickness of the 35-mm. film.

The Bipack process has the advantage of all subtractive processes that it is easier to get full illumination, since the white is clear film on both positives, whereas in the additive processes the white has to be made up from patches of three colours and requires therefore more than three times as much light.

Travellers who are interested in the technique of colour photography may be glad to be referred to the Presidential Address to the Royal Photographic Society by Dr. D. A. Spencer, published in the *Photographic Journal* for February 1937, which gives an authoritative account and discussion of the processes then available. One may be allowed to say that the Bipack process cannot give as perfect a colour rendering as the Kodachrome film, of which we have seen so many excellent examples in the last few years, but the latter is not yet available in standard size film for motion pictures.

JAPANESE PORTS

We are informed by the Foreign Office of the following changes. From 1 July 1940 the open ports of Shimonoseki and Moji were combined into one port known as Kammon. The boundaries of the port of Kammon are a line drawn from the top of Mount Tobigasu (Tobigasuyama) N. 40° W. and a line from the top of Mount Kompira (Kompirayama), on the island of Hikoshima, due west to the boundary of the port of Wakamatsu, together with the area inside the lock gates on Hikoshima.

From 20 May 1941 the ports of Tokyo and Yokohama were combined into one port, known as Keihin. As a result of this change the port of Yokohama will disappear from the list of open ports in Japan and will be replaced by the port of Keihin. The boundaries of the port of Keihin are a line drawn S. 13° W. from the west bank of the mouth of the Arakawa drain and a line drawn N. 47° E. from Hommoku point (35° 24′ 42″ N. 139° 40′ 10″ E.).

CHANGES OF CLIMATE IN BRITISH EAST AFRICA

Dr. Erik Nilsson has published a comprehensive review of his work on the Pleistocene geology of British East Africa and Abyssinia (*Geografiska Annaler*, 22 (1940) 1–79). Around the shores of the numerous lakes of the Eastern Rift Valley are traces of former, higher, lake levels, while in the highest mountains moraines indicate ancient glaciation. From the available data Dr. Nilsson concludes that "a series of alternating wet and dry subepochs with decreasing intensity have followed each other up to the present time." The author found similar evidence of high-level lakes in the Tana basin on the Abyssinian

Plateau, together with lacustrine sediments on both sides of the Blue Nile gorge. Some of the ground is described for the first time, some had already been observed by geologists. Dr. Nilsson's account contains much local detail and evidence which it is impossible to review in this note, together with suggested correlations with the Pleistocene geology of Egypt. On all these questions there is perhaps still considerable scope for debate and some may hesitate therefore to accept the author's far-reaching conclusions, which involve climatic changes contemporaneous all the world over. On the other hand his work and views on a succession of pluvial and inter-pluvial epochs, mingled with volcanic activity and important earth movements which have influenced the development of the Nile valley, are clearly set out and demand careful study.

VARIABILITY OF RAINFALL IN NEW ZEALAND

In the *New Zealand Journal of Science and Technology* for July 1940 there is an article by Mr. C. J. Seelye on the variability of annual rainfall in New Zealand, with a map showing this expressed as a percentage. The results are based on one hundred and fifteen rainfall stations with records covering thirty to thirty-five years, the period 1901–35 being adopted as the standard, but supplementary information has been taken from over two hundred stations with shorter records. The percentage variability for most of the Dominion lies between ten and twenty, a range similar to that of the British Isles. The extreme range between dry and wet years lies between −50 and +175 per cent. of the average annual rainfall; the greatest rainfall deficits are in the dry region of Canterbury and Marlborough, the greatest excesses on the east coast of the Auckland Province and Hawkes Bay; in 1936 Stephen's Island had more than 232 per cent., three times the average rainfall.

The map shows that the variability decreases slightly from north to south, partly owing to the greater number of tropical cyclones in the north; and increases from west to east, the westerly winds being more regular than the easterlies. Thus in Taranki, Westland, and Southland with persistent westerlies the variability is low, but in the Auckland Peninsula, and much of the east coast of the South Island, where easterly winds bring a fair proportion of the total rainfall, the variability is greater. Because of the irregularity of the easterly winds more detailed information of the variability close to the crest-line of the New Zealand Alps would be welcome; the map does however show a figure as high as 16 per cent. far up on the eastern slopes of the mountains beyond the Canterbury Plains.

THE SOILS OF TASMANIA

The Division of Soils of the Australian Council for Scientific and Industrial Research has issued (Bulletin No. 139, 1941) a revised soil map of Tasmania with text by Mr. C. G. Stephens. The map, approximately on the scale of 1/M, shows in colours the general distribution of thirteen soil types, and is contoured in accordance with the latest available information. The text summarizes systematically much published and unpublished material, and includes mechanical analyses, chemical data, and profiles for the various types of soil. The pamphlet begins with a summary of the physical conditions, of which in addition to the petrographic characteristics, the most significant are the very mountainous nature of the island and the prevalent westerly winds, resulting in the general contrast between the western areas with high rainfall and the drier east. Over most of the island there is useful rain throughout the year, and there is no great temperature range in the settled areas between summer and winter. In the coastal and eastern regions the range for the three winter months

is approximately 45°–50° F.; the average for the north-west is above 50° F., so that winter pasture growth is important.

Three of the soil types enumerated are of wide extent, though a number of the less extensive are of economic importance. The first in extent is the normal podsol type, varying in character in relation to the amount of rainfall, which controls the organic content and the degree of its penetration. The two main divisions are distinguished by the natural vegetation, savannah woodland and sclerophyll (Mediterranean type) forest in the east, wet sclerophyll and rain forests in the west. The texture varies considerably, comprising clay, silt, and sand loams. In certain areas, *e.g.* the Huon and Mersey valleys, this type includes the chief apple-growing areas, and tobacco has recently been successfully grown on the well-drained podsols of the north-west. Along the west coast the button-grass plains type is widespread. This comprises peats or peaty sands with a water-table close to the surface; where drainage is better the normal podsol type is found. Apart from mining there is practically no settlement here. The third extensive type, the high moor soils, is also of little value. It occurs above the 2000-foot contour in the central plateau, and other mountainous areas particularly in the south-west. The deep fine black peat is covered by a carpet of moss and low shrubs, or, if affected by erosion, by sub-alpine woodland. Important but less extensive types include the black soils, often developed in the drier areas on dolerite or glacial moraines and gravels, south of Launceston and east of the Derwent estuary. These clay loams and clays are important farming areas. The series of soils developed on the basaltic flows of the north-west coast are also very fertile, as are the black peaty soils of reclaimed swamps in the north-west and on King and Flinders islands. Finally there is the principal area of alluvial soil in the Derwent valley, widely irrigated, and farmed intensively.

The writer concludes by discussing the chief problems of the use of the land. Beyond a little grazing the button-grass plains are not exploited, but it is considered that by burning, drainage, and liming, pastoral development would be possible, as on similar soils in the South Island of New Zealand. The reclaimed swamps and dunes are centres of coast disease in livestock, but this could be remedied by the provision of copper and cobalt licks. The declining fertility of the basaltic soils could probably be checked by the application of lime and superphosphates. The best prospects for development are in the Launceston basin, where there are large areas of podsols capable, with the use of superphosphates, of carrying improved pasture. Forestry should offer another opportunity for progress. Supplies of commercial timber will soon be exhausted, and its production in certain conditions may become more profitable than stock-raising. It is suggested that the marginal basaltic soils above 1000 feet should be planted with exotic softwoods in place of eucalypts.

OBITUARY

COMMANDANT JOSEPH HACKIN

Joseph Hackin deserves the special esteem and gratitude of Englishmen for the magnanimity he showed in welcoming the cooperation of British archaeologists in his archaeological work in Afghanistan. For many years the Indian Archaeological Survey had cast covetous eyes on the archaeological treasures of

Afghanistan so intimately connected with the great finds they had already made on the Indian side of the Afghan border, and when Afghanistan was at last opened up to European investigation they had the right to expect that to them the Afghan Government would give the first invitation to carry the Archaeological Survey across the frontier into Afghanistan. To their chagrin the British were passed over and the offer was made to the French. But the great-hearted Hackin, when he was appointed chief of the Archaeological Mission to Afghanistan pursued no dog-in-the-manger policy. He invited the British to join with him and always generously acknowledged their help.

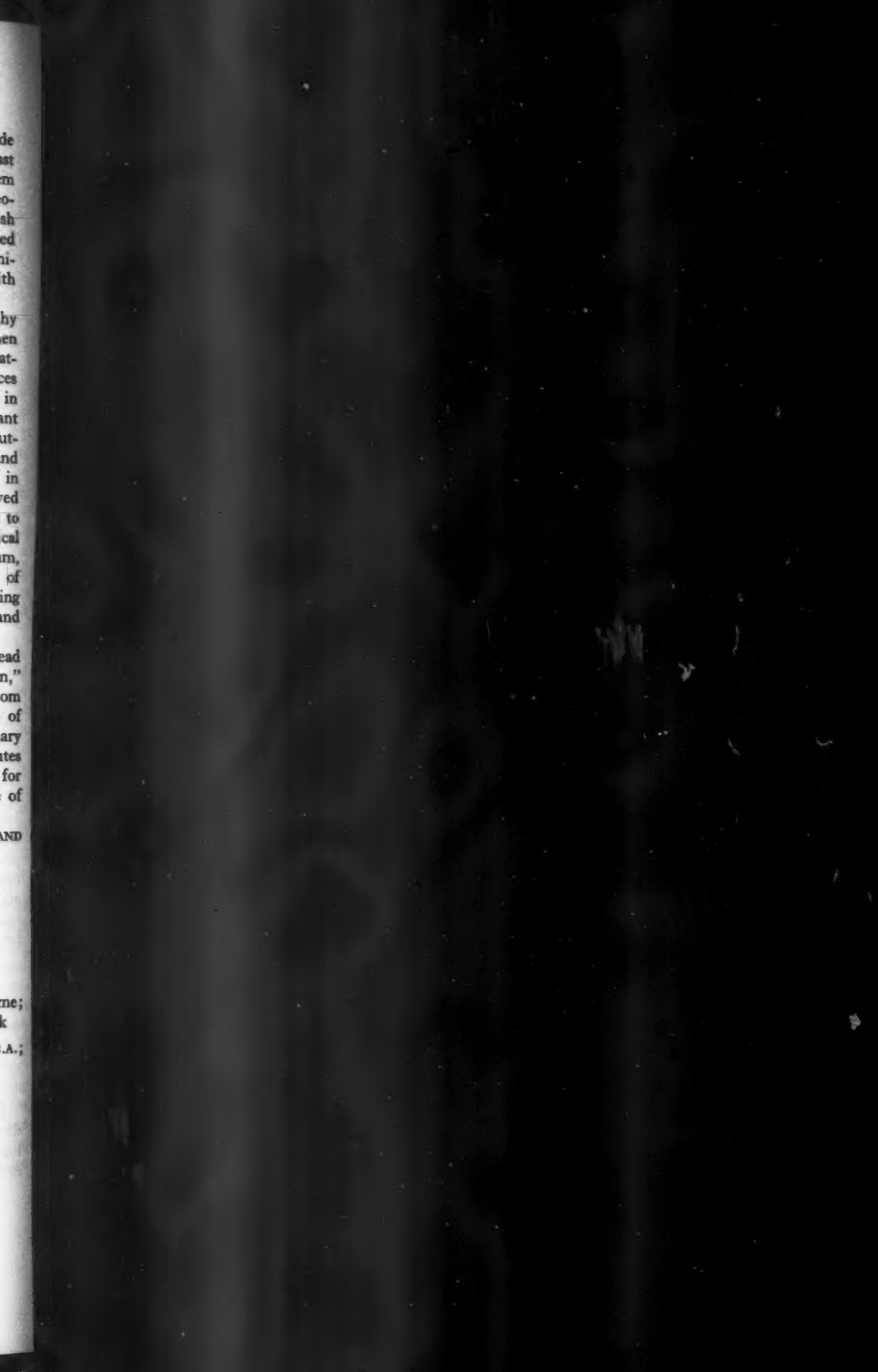
Hackin in body and in mind was built on big lines. Born in the Grand Duchy of Luxembourg in 1886, he devoted his life to the service of France, and when the French Government capitulated to the Germans in 1940 he was too great-hearted to acquiesce in the total surrender but joined the Free French Forces and died in the service of France. He was as a young man keenly interested in Oriental languages and Oriental Art. In 1913 he was appointed assistant director of the Musée Guimet of Indian and Far Eastern Art. But on the outbreak of the war of 1914–18 he joined the 74th Regiment of Infantry and was present at the Battle of the Marne. He was twice wounded in 1915, in 1916–17 he took part in the defence of Verdun, and later in the war he served on the Danube and in the Ukraine. After the war he was sent on a mission to Afghanistan, and in 1934 he was appointed Chief of the French Archaeological Delegation to Afghanistan. It was here, principally at Bamian and Begram, that he accomplished the chief work of his life, tracing the development of Persian-Buddhist Art and its spread eastward into Chinese Turkistan. Joining this art with Greek Art he was thus able to show the connection of East and West across Central Asia.

At the meeting of our Society on 20 November 1933 Monsieur Hackin read a paper "In Persia and Afghanistan with the Citroën Trans-Asiatic Expedition," and in 1936 became a Fellow of the Society. He arrived in London from Afghanistan in October 1940 and for some months directed the service of Foreign Affairs at the Headquarters of the Forces Françaises Libres. In January last he found time to speak at another meeting of the Society on "Routes anciennes en Afghanistan," but was unable to complete the manuscript for printing before he was sent away on a diplomatic mission, in the course of which he and his wife were lost at sea by enemy action.

FRANCIS YOUNGHUSBAND

ELECTIONS

The following have been elected Fellows of the Society:

On 11 August 1941: W. E. Higgins; C. H. Holmes; R. E. W. Hume; Miss Rosemary Parkes, B.A.; W. P. Smith, R.E.; The Rev. H. E. Strudwick

On 25 August 1941: K. B. G. Cossar; Capt. E. D. Davenport, B.A.; Capt. V. H. Holroyd; The Rev. J. R. Renshaw, F.PH.S.